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Fig. 1—Firing a ¾-in. steel stud into a ¾-in. solid plate to a predetermined depth

Gunpowder Deserts Mars for Vulcan

By Chester B. Lord
Associate Editor, American Machinist

A shotgun with its muzzle clogged is dangerous, but this gun, with an equal charge of powder, can be shot with its muzzle pressed hard against a metal plate. The recoil is no greater than that of an air hammer

THE ANTIDOTE to destruction is construction. Any war must eventually give place to industry. Following any given war, one of the first manifestations of peace is the attempted conversion of the implements of war into the implements of peace, and that country is most fortunate which can carry this conversion furthest.

Those who are conversant with the mechanics of war, understand that a major problem is whether a projectile can be devised that will penetrate any armor, or whether an armor plate can be developed that will turn any projectile. This ballistic controversy has been introduced into industry as one of the conversion items, but a happy compromise has been arrived at by allowing the projectile to penetrate the plate to a predetermined depth.

The device that commercializes this penetration by percussion employs what is known as the delayed action principle, a principle somewhat analogous in its effect to pre-firing in an automobile engine so that the piston will start down with maximum pressure. Pre-firing was tried out during the war, both to increase the range of a projectile, and to lessen the shock of recoil in airplane guns.

The action of the industrial device, covered by this

article, called the Temple gun, is therefore radically different from that of ordinary practice. The gun itself has the appearance of a light weight riveting hammer, and its weight, which is 15 lb., permits it to be used as conveniently as an air hammer, unhampered by a hose.

The gun shown in Fig. 1 is driving a ½-in. stud into a ½-in. solid plate, with a charge of ordinary sporting powder. The recoil and consequent shock to the operator is no greater than that caused by a riveting hammer of corresponding weight. The maximum capacity of the gun is a 1½-in. stud into a 1½-in. plate.

A ½-in. stud requires a charge of 21 grains of powder, while the 1½ in. cartridge carries 48 grains. The charge for an ordinary 12-gage shotgun is about 28 grains. The recoil, however, of the Temple gun is very much less than that of an ordinary shotgun or rifle, because of the delayed action principle that is used.

The stud and cartridge are assembled similarly to ordinary "fixed" ammunition with the difference that one end of a "breakpin" is screwed into the head of the cartridge, and the other end into a hole tapped in the inner end of the stud. For a ½-in. stud, a ¼-in. diam. breakpin is used, reduced to ⅛ in. at its center.

Fig. 2—Close up of plate shown in Fig. 1. Studs Nos. 1 and 2 were driven under 180 feet of water, the other two on the surface. Two of the studs shown are hollow. The ⅝-in. hole was punched by the same method

The projectile does not leave the gun at the moment the powder charge explodes; instead, a pressure is built up between the head of the cartridge and the end of the stud, until it reaches the capacity of the breakpin. This "lets go," and the stud leaves the gun at much higher velocity than is possible with a sporting gun using the same charge. The recoil is caused by the breaking of the pin, and not by the explosion of the charge.

The effect that this delayed action has on building up pressure was illustrated in its war time application to a mine thrower. With an ordinary charge, a 200 lb. mine was thrown 400 yards, with a 2-in. breakpin the distance was increased to 1,200 yards. The varying rupture point of the breakpins, however, was fatal to accuracy.

Not the least remarkable feature of the Temple gun, and the one that makes its commercial use possible, is that which permits it to drive studs to a predetermined depth. The gun operates equally well under water.

How uniformly the penetration can be controlled under varying conditions, is shown in the "close up" view of the same plate, in Fig. 2. Two of the studs were driven under 180 ft. of water; one is solid, the other has a ¼-in. hole clear through it. This under water test was intended to demonstrate a method of supplying air and water to the crew of a sunken submarine, by means of one or more lines of hose to the surface. Two more of the studs, one solid and one hollow respectively, were driven above water. It will be noticed that the penetration is uniform. Neither weight of stud nor resistance of the water seems to affect the operation.

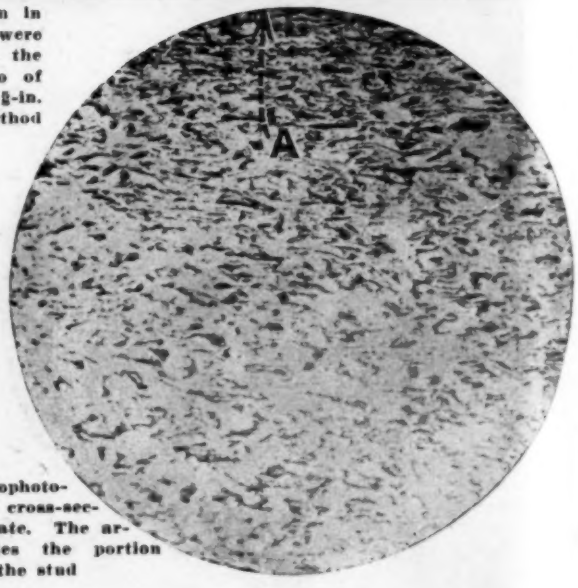


Fig. 5—Microphotograph of a cross-section of a plate. The arrow indicates the portion adjacent to the stud

The reason why the end of the solid and the hollow studs have the same general appearance is, because, in both cases the end is drilled and tapped for the ¼-in. breakpin previously referred to.

If it is desired to use a through bolt instead of a stud, a punch may be substituted for the stud, and a clean round hole such as is shown, will be the result. In this operation, a slug of metal is removed, but not when driving studs or pins.

Practical application of the method is shown in Fig. 3. Here, a patch plate 12x12x¼ in. has been applied to a torpedo flask $\frac{7}{16}$ in. thick, using eight ½-in. studs. In this application the patch was drilled with a $\frac{9}{16}$-in. drill. The patch and gasket were centered over the opening in the

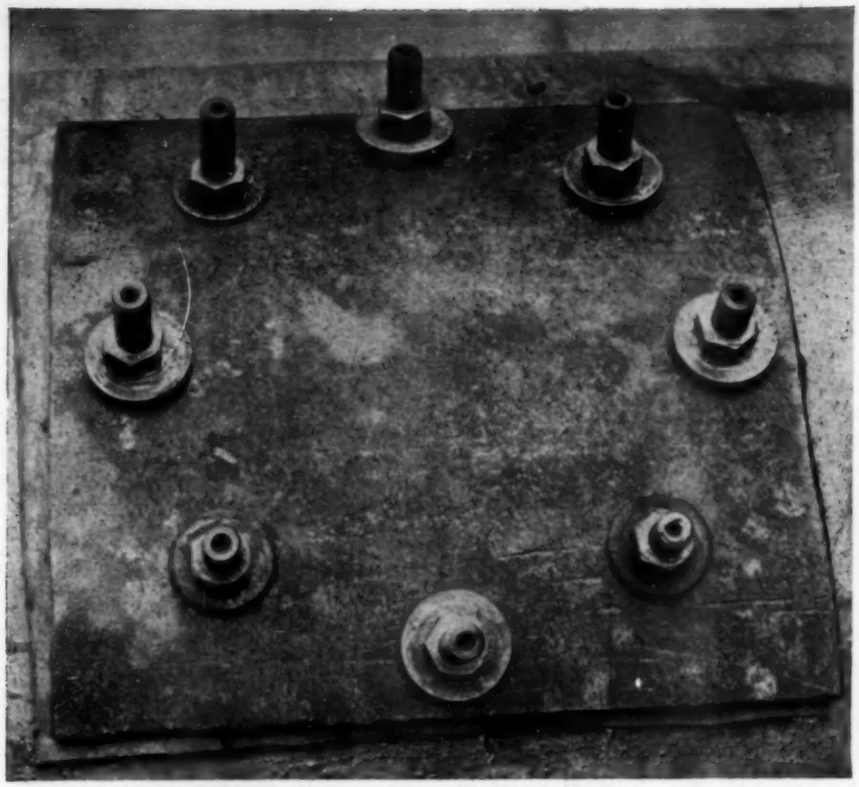


Fig. 3—Applying a patch to a high tensile steel, torpedo flask. The cylinder, as shown, is under 200 lb. per sq.in. pressure

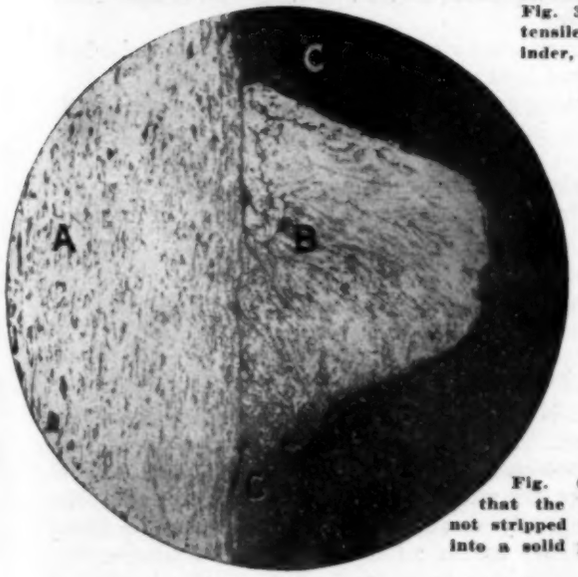


Fig. 6—Showing that the threads are not stripped when driven into a solid plate

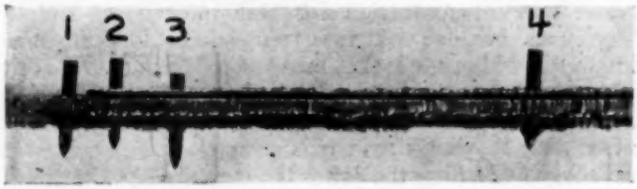


Fig. 4—Holding plates together by pinning. Two of the ½-in. studs have been driven through $\frac{1}{16}$-in. holes into a ⅜-in. plate, the others through two, and three solid plates

flask, and the ½-in. studs were shot through the drilled holes. The flask was afterward subjected to an internal pressure of 200 lb. per sq.in., and there was no evidence of leak. The photograph was taken while the tank was under pressure.

It is not necessary to drill holes through the top plate, but where a soft gasket is to be used it is advisable to do so. Fig. 4 shows other methods of holding two or more plates together. Two of the ½-in. studs have been shot through holes $\frac{1}{16}$ in. less in diameter than the stud, into a solid ⅜-in. plate. Another has been shot through two solid ⅜-in. plates, and the remaining one through one ½-in. and two ⅜-in. solid plates. In all three of these methods, the plates are pinned together, and no nut is required. Pins shot through solid plates will hold the plates together tightly if they are in that condition when the pin is fired, if not, a slight burr will be thrown up at the exit side of each loose plate and they will not be pressure tight. Where a ½-in. stud is driven through a $\frac{7}{16}$-in. hole, no burr is formed and the plates are drawn tightly together.

The ragged appearance of the plates is caused by cutting them with an oxyacetylene torch, and the reason for cutting them was to show that there had been no distortion caused by the compression of the material around the studs. When the stud, or pin, is shot through the solid plate it does not remove a slug of metal, it simply compresses it at right angles to its direction. It is done so quickly that there is no evidence of distortion and only a barely perceptible temperature rise.

While it is obvious that a considerable disturbance of the metal must take place, a microphotograph of 500 diameters, Fig. 5, showing the section around the pin, does not indicate an unusual grain structure. Another microphotograph of the same magnification, Fig. 6, shows that the thread on the stud is not stripped. The dark portion is the stud, and the flank of two adjacent threads is shown, the metal from the plate has expanded into the land between the threads and has apparently been dragged by the stud. Whether there is a cleavage of the material between the threads, and the body of the plate is not quite clear. It would be interesting to compare the pressure necessary to remove a driven and a tapped stud.

The pressure, applied to the end of a driven stud, that is necessary to remove it from a plate that corresponds in thickness to the diameter of the stud, is 7 tons for the ½-in. and 20 tons for a 1½-in. stud. Obviously they cannot be pulled out, because the allowable stress for a ½-in. bolt is only 760 lb. and even if a factor of safety of 10 was used, its strength would be only approximately one half of 7 tons.

The question that naturally occurs to the shopman is: if a ½-in. stud can be driven into either a $\frac{7}{16}$-in. hole, or a solid plate without stripping its thread, and if the force necessary to remove the stud is many times its ultimate tensile strength, why tap threads?

The struggle to eliminate tapping is as old as the tap

itself. The means employed have been various and ingenious. Through bolts, force fit rivets, knurled, and expanding end pins, were the first cycle. Then came hardened rivets with steep pitch spiral threads that cut their way as they were hammered into a hole drilled to the size of their pitch diameter. Later it was found that a heat-treated stud with a standard thread, could be used in the same way, but this method has not been generally adopted, because it was thought that forcing a larger stud into a lesser hole must either enlarge the hole, or reduce the diameter of the thread.

Notwithstanding our reluctance to accept this practice we do accept a forced fit with smooth surfaces, either straight or tapered.

It is a curious psychological fact that many people, who, through so-called conservatism, hesitate or refuse to adopt a new method or process, will do so immediately it has been supplanted by a still later method. It is, therefore, possible that heat-treated studs may be forced into blank holes, now that it is commercially possible to drive a soft, threaded stud into a solid plate without stripping its threads.

Tempering Cutting Tools

By J. T. Towlson,
London, England

THAT such alloys as Widia, Carboloy, and Stellite have entered the field against the traditional steels is a quite familiar fact, but it is no less a familiar fact that high-speed steels are still in favor in hundreds of machine shops. Such steels are recognized as the dependable cart horses of machine-tool work, requiring just ordinary care and no coddling, while the new alloys, though excellent for their purposes, require as much care and coddling as a race horse. To back up my contention as to the value of steel of a certain kind, I have it on record that certain piecework prices have been agreed to by machine men in this country, and that a condition of their acceptance was the permission to use a certain, air-hardening steel of British production. This is quite a common practice, the material referred to being an air-hardening steel that requires no tempering and that is good for cast iron, steel, and non-ferrous metals.

In the following paragraphs, however, no particular brand of steel is referred to, and the information given is applicable in a general way to the working of all steel that is used for tools.

As with many commodities, the best steel is the cheapest, a point too frequently overlooked by the purchasing section, but with which the practical machinist and the toolmaker are familiar. There are few, if any, establishments where the cost of tool making and repairing is not far in excess of the actual steel bill. Most emphatically is this the case with taps, reamers, milling cutters, thread dies, etc. An apparent saving in cost of tool steel usually means a loss of efficiency in terms of durability.

It is common knowledge that sufficient importance is not always attached to the heating of tool steel for forging, annealing, and tempering, and that breakdowns are directly attributable to improper treatment. It is also a fact that there is a fixed temperature at which steel of a certain percentage of carbon content should be hardened. If this is determined, and the correct temperature adhered to, any particular steel will harden and temper with the least possible strain to its structure. It will possess the finest grain, and, in consequence, be in its strongest condition. What is true of carbon steels is just as true of the alloys constituting the familiar, high-speed steels. As a guide to the purely practical man the following figures are given from the writer's personal experience:

Carbon, per cent	*Color*	*Max. deg. F.*
1.50	Cherry red	1440
1.25	Bright cherry	1485
1.10	Red	1524
1.00	Full red	1575
0.87	Bright red	1620
0.75	Full bright red	1710

It should be noted that for all these carbon steels the critical point is 1250 deg. F. coming down, and 1300 deg. F. going up.

It is an erroneous idea that hammering tool steel when at a black-red heat will improve its endurance.

When taking hold of a heated piece of tool steel with tongs, it is important that the tongs be neither wet nor cold.

High-carbon and low-carbon springs are heat treated similarly, except for a difference in the rate of cooling.

Using Blind Ads—*Discussion*

By Charles R. Whitehouse,
Chief, Time Study, Holtzer-Cabot Electric Company

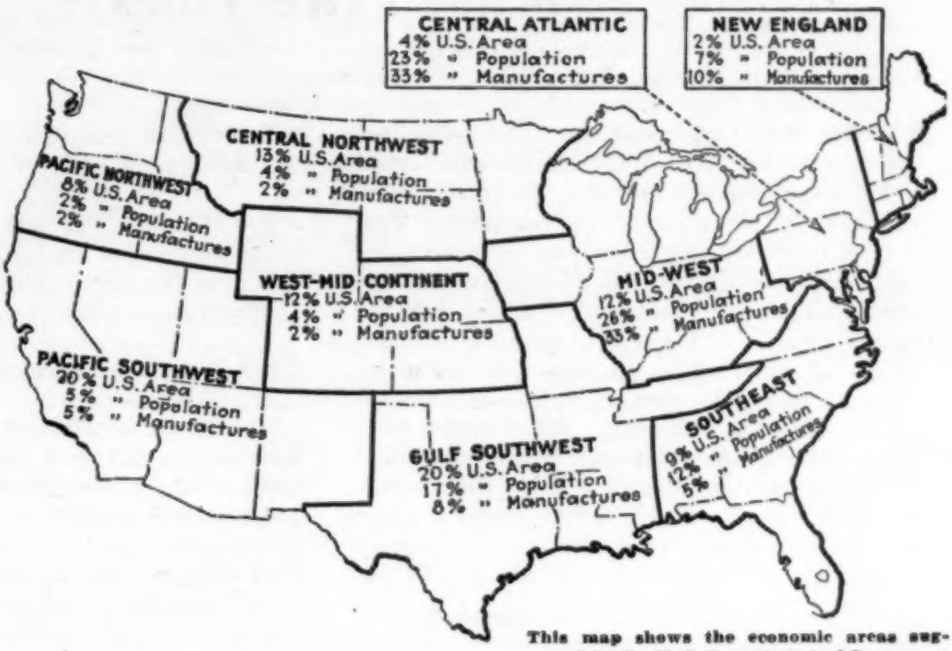
THERE is definite danger to the advertiser in using blind ads. I am reminded by Mr. Kruger's article on Page 862, Vol. 71, of *American Machinist* of an acquaintance of mine who inserted such an ad. He received in reply more than 70 letters, most of them just as "blind" as his ad had been, and consequently, requiring interviews to clear them up. The inevitable result was dissatisfaction for both interviewer and interviewed because of the tremendous loss of time involved. Many of the men were unsuited for the work, or were unable to qualify for other reasons. As a matter of fact, none of the applicants were accepted after all. A young man of my acquaintance who was capable of handling the job was introduced to the advertiser and got the job. He is now assistant master mechanic, and has never read or answered a blind ad in his life.

This instance is but one of many. The same thing is occurring day after day in plants all over the country. An open ad, stating directly and fairly the type of position open, and similar essential information, will inspire a like attitude of openness on the part of the applicants —with better results all around.

WANTED:

New Bridges for Business

The New England Council has pioneered the way for the establishment of other regional economic councils. Such economic bridges between national and local business organizations would work on problems common to certain natural economic areas.



This map shows the economic areas suggested by the U. S. Department of Commerce.

DYNAMIC in effect, dramatic in conception, the Hoover conference with the leaders of American industry did much to dispel doubt, rebuild confidence, inspire emulation. Public officials, railroad presidents, heads of great utilities, captains of industry made public announcement of their programs for 1930, and left the nation gasping at the titanic proportions of the work planned for the twelve-month.

It is no criticism of the National Business Survey Conference or of older commercial and industrial organizations, to say that there is a conspicuous hiatus in the organization of American business. We have an excellent Chamber of Commerce—a national organization. We have many local industrial and commercial bodies. We have trade associations which are national but entirely vertical. The obvious gap is the lack of regional organizations.

Yet many of the most important problems business has to solve, can best be attacked by regional group action.

One section of the United States is really ready to carry out the Hoover program quickly and efficiently. New England has the means of seeing to it quickly, positively, that a program originated by leaders shall reach down to the individual shop in the smallest village. New England is ready to act with a breadth that crosses city limits and even state lines, to accomplish things that benefit a natural economic area, things that cannot be done by one city or one state.

Each natural division of the country would do well to organize, as promptly as possible, a council on the general model of the New England Council. The present business situation, the urgent need of pushing the Hoover program through, serves to bring the need for such regional councils into sharp focus, but by no means should such organizations be regarded as temporary or emergency affairs.

What are the problems which can best be attacked by regional co-operation? They differ, of course, for each region. A few types of activity, however, immediately suggest themselves:

1. There is the problem of utilization and conservation of natural resources. This cannot be attacked by local organizations, since it is seldom a problem concerning a single state or locality.
2. Many agricultural problems are best handled by regions.
3. The problems of industry group themselves according to economic divisions rather than by political lines. Supply and distribution of raw materials, transportation—these things pay little attention to state boundaries.
4. Distribution of power is no longer local. Nor is it a state matter. A regional council could materially assist the utilities in the solution of their problems.
5. There is a great job to be done in co-ordinating the activities of all local and state chambers of commerce, associations, service clubs, co-operative societies, and so on. There are many other regional jobs to be done. This is enough to indicate the need for such action.

Given the outstanding example of successful sectional co-operation through the N.E.C., these proposed new councils will provide the urgently needed bridges to span the great gap between national and community effort.

Abstract of an article, entitled "A Plan to Promote Economic Balance," that appeared in *The Business Week* for January 8, 1930.

EXECUTIVE · FORUM

What Price Titles

THE SALARY committee of Empress Machine and Tool Works sat in semi-annual and acrimonious session. Pile after pile of departmental recommendations littered the stout mahogany table; row after row of names and neatly juxtaposed figures faced the men who surrounded it; tray after tray of burned out cigar and cigarette ends. At the head of the table, Malcolm MacGerald presided, his secretary-treasurer at his right hand, and William Holland, perennial advisor to industry, at his left. When sales department and manufacturing department meet head on, sparks are bound to fly. Alvin Burke, vice-president in charge of distribution, glowered across at Joseph Hedcamp, vice-president in charge of production, and it is only fair to say, old Joe Hedcamp returned glower for glower.

Unlike the merry men in charge of Gotham who agreed recently and unanimously on a wholesale salary raise for themselves, neither Burke nor Hedcamp could see the other man's point of view. Both had the best interests of the Empress Works at heart, but each felt that his own department was more vital to the success of the firm than the other's. My department must certainly get a bigger boost than yours.

Said Al Burke, "Where would you be with all your machinery and thingamajigs, if we didn't sell the stuff to keep you busy?"

Said Joe Hedcamp, "Yeah? And where would your white collar boys be if we didn't make the stuff that they take orders for? Who can say anything about selling when we all know that Empress quality sells Empress products? Sell, my eye!"

Said Malcolm MacGerald, "You two old cronies are getting to be worse old maids every year. Can't I ever convince you that your two departments are equally vital to our success? We're here to discuss salaries. Let's go."

One by one, the committee took up the minor ratings and salaries in the organization. All were discussed and approved in quick succession right down to Burke's assistant and Hedcamp's assistant. There the meeting stopped, mired to the hubs like an automobile in an early spring detour.

Said Burke, "My assistant has been doing wonderful work all year. He ought to be good for at least another ten per cent in sound cash money."

Said Hedcamp, "If yours has been doing wonderful work, mine has been performing miracles. He's good for twenty, what with the rotten sales specifications he's had to meet. I tell you——"

But Hedcamp did not complete his thought.

"Boys," cut in Holland. "Here's a way out. Both of you call your assistants by the title of 'assistant to the vice-president', don't you? Well, under your charter, you don't need a directors' meeting to appoint 'assistant vice-presidents'; why don't you give them the new titles? To be known as assistant vice-presidents may give them more encouragement and satisfaction than to receive a raise. Am I right or am I not?"

—◇—

What Do You Think About This Executive Problem?

William Holland has made a suggestion, which can only be a temporary expedient at best. In this instance many will question the wisdom of his advice, but this year like any other year, just as many employers will pay their employees with high-sounding titles as with high salaries.

Is the practice justified? Do high titles take the place of high salaries? This forum, certainly, presents a problem on which all readers have opinions, and *American Machinist* will welcome receiving them. Those accepted and published will be paid for.

DISCUSSION

OF PREVIOUS PROBLEMS

Will It Pay to Enlarge the Plant?

I am not quite clear as to just what James Mackey meant in saying that he could keep up with orders. Was he working two shifts, and still months behind with deliveries, or was he jogging along with one shift working at normal pressure? If the plant has really reached the limits of production, it will pay to enlarge; but until the uttermost limit is in sight, it is usually not economic.

The more hours per week one can keep a machine going, the better it pays, from nearly every point of view. The more hours worked per week, the lower the overhead per hour. If a machine has a useful life of 15,000 working hours, it is better to work it 100 hours per week for 150 weeks than 50 hours per week for 300 weeks. For the whole of the former period, it will probably be up-to-date, and in the latter case, the question may easily arise of replacing it as obsolete, before it is worn out. The time to enlarge a plant is when a double shift is unable to cope with all the orders which could be booked, and further increase seems likely. While the extension is being made, a third shift can be put on, and the extension should be sufficient to enable a double shift easily to cope with orders.

A plant which, when orders slack off, has worked at full capacity for two to three years, should be in a strong financial position, making it possible not only to stand slack time but to reorganize and to buy the most modern plant when it is easiest, most necessary, and beneficial.

A plant extended to cope with all orders in a single shift is in a comparatively weak position. Its machinery is either obsolete or as yet only half paid for, and if the slack period lasts two or three years, part of the plant may be allowed to fall into disrepair. It will certainly have difficulty in raising money for reorganization. I have seen plants adopt both courses and have no doubt in my mind as to which is the wisest. Sinking a lot of capital in new buildings and plant at a boom period is intellectually easier, but economically less profitable than solving the problems of management involved in working up to a true maximum capacity.

—H. JAMES, *Birmingham, England.*

Upsetting Production Schedules

No matter how good and promising a new line may be, it has to be remembered that, at first, there is almost certain to be a relative slowing of the wheels of production. It takes time for adjustment, even under the most favorable circumstances. This applies generally as regards design as well as production. That familiarity with routine which renders effort more or less automatic has yet to be won; it is not of mushroom growth. Until it is won there will be unavoidable temporary reduction in the rate of progress, as compared with procedure on ordinary and familiar production. The new departure, however, will in time become the established practice. Then schedules of production should keep time with those of the present familiar lines.

One great thing to remember, however, is that because a thing is new it need not necessarily take precedence over all and sundry. It must take its true place in the scheme of things, and the claims of the old must be considered in an unbiased light. It is possible so to ride roughshod over the old and well-tried that the new, instead of helping, actually hinders prosperity. The alert management will insist that the claims of the established and the yet-to-be-established shall be met on merits. Production will take cognizance of priorities of delivery dates, and play the game. Then, on both grounds, the result should be distinctly beneficial. Progress will continue on rational and truly successive lines; sequence will be strictly observed, and production schedules will be adhered to.

—W. R. NEEDHAM, *Design Engineer, Strafford, England.*

The Night Shift

There are two obvious reasons why men are willing to work at night. One is that they are unable to find suitable employment during the day, the other is that they can make more money working at night. Consequently, if nothing is offered in the way of increasing compensation for night work, the only men obtainable will be those who are unable to find suitable employment during the day. Men on the night shift seldom take a real interest in their work, because few of them expect to continue working at night. They are constantly on the lookout for something else, and men who are in search for other jobs seldom produce first-class work.

The bonus and shorter working hours at night are about the best answers to this problem. They make it possible to get men who are satisfied with their jobs in view of the shorter hours and increased compensation. This plan apparently means a greater expense to the firm employing men at night, but it will usually be cheaper in the long run. Another method which has proved successful with some firms is to have the men alternate, working a week or two at night and then the same length of time during the day.

—W. J. OWENS, *Foreman, Newport Rolling Mill Company.*

Does a Highly Developed System Pay?

In one instance that came to my attention, a too highly developed system proved detrimental. It was the practice of the company to order all equipment according to a definite system. The need unexpectedly arose for the ordering of emergency equipment, but the highly developed

system made no provision for anyone to do the ordering. Production was therefore delayed until the authority for placing the order was determined.

While a highly developed system pays in the general run of business, emergencies are bound to arise, and provision should be made for handling them according to the judgment of the men concerned. The authority for ordering materials or machines should rest with some individual or department. But provision should be made for handling this and all other responsibilities by emergency measures if the need arises.

—HARRY KAUFMAN, *Public Accountant.*

Making a Manager Out of a Foreman

The foreman has a rather peculiar position. He is of the management and yet subordinate to it. His various duties are responsible ones, and he must keep down all costs to the proper level. But his main consideration is production; his chief duty is to get the work out on time and in the right condition. He should be kept familiar with all that is going on, and should be in a position to know all of the facts concerning the conditions of the business and the policies of the company.

Unless the foreman is a mere figurehead or straw boss, he is already a sort of manager. By the very nature of the position he holds, he is a valuable part of the factory management. As such, he is entitled to a voice in all proceedings concerning his department. In no other way, can his side of the questions be heard and given the proper consideration. Yet he should not be expected to carry a large burden of the responsibility of financial decision. When his ability is developed to the point of carrying such important acts of responsibility, he is too valuable a man to leave in a departmental foremanship, and should be promoted to a higher executive position.

—L. O. BROWN, *Toolroom Foreman, Holcomb & Hoke Manufacturing Company.*

Upsetting Production Schedules

The problem brought forth in the October 24 number of *American Machinist* is typical of the sort of thing which occurs in manufacturing plants; it is of such common occurrence that it deserves our consideration. "Riding" the shop is but seldom justifiable and is due, in most cases, to misinformation, misunderstanding, or dissatisfaction; whatever the cause, it seems that many executives think it a natural state of affairs.

The executive, who is responsible for the volume of production of his plant and the fulfilment of promised orders, must take into account the fact that the shop, too, has its troubles; it does not always have the proper machinery and tools to do the work in the most advantageous way, and it is constantly confronted with the very complex labor problem. When one is far removed from the field of direct production, it becomes increasingly difficult for him to appreciate the difficulties which confront the man in the shop. The sales manager may or may not be thoroughly familiar with production complexities. He may be a shareholder, his commission may increase more rapidly with his increased sales, he may be eager to please some favorite patron, or he may seek to impress his employer. On the other hand, the president may not be fully conversant with shop conditions and methods, he may have held the chair for many years, and has thus gradually receded from the phases of manufacturing. He may have been in conference with the superintendent, the production engineer, or the general foreman and may have been erroneously influenced. It is obvious from the foregoing, that under those circumstances it will be extremely difficult for either the president or the sales manager to gain a true perspective of the productive capacity of their respective plants. Consequently, they blame the shop for not having completed certain orders at specified dates.

From these generalizations, we would deduce that the shop should be given due time in which to do the work. Of course, there are many cases where the shop is actually at fault; these, when discovered, should be dealt with severely. In most cases, however, a close investigation will reveal that certain machinery was not available, that some necessary fixtures had to be made or purchased, that it would have been too costly to tear down certain set-ups to get this particular job in, that quotations on some material were pending, or that the proper kind of labor was not available. All of which are important and can be coped with successfully only by the initiative and good judgment of competent executives.

—GEORGE BELBES, *Chicago, Ill.*

Should a Plant Take an Annual Inventory?

In the accounting department, there is always a shade of doubt if no inventory is taken at the end of the year, especially in plants where large sums are invested in stock. The value of the stock on hand may be estimated, but estimated figures are often deceiving. Besides, the management is entitled to accurate figures. There may be some good reasons, why the annual inventory should not be taken, such as production schedules and giving the employees full time. Since the advent of the income tax, however, it is imperative that an inventory be taken.

Most plants are not very busy around the holidays, and if they shut down during the holidays every year, employees will know what to expect and will be prepared for it. Even though it is found necessary to run the plant, while taking inventory, production schedules should be maintained. If taking inventory does upset production schedules, it is time to start a better house cleaning campaign.

—W. J. OWENS, *Cincinnati, Ohio.*

Wedge Dies Solve Nash Press Job

By Frank J. Oliver, Jr.
Western Editor, American Machinist

An analysis of some typical die designs developed by Nash engineers for drawing and embossing the radiator shell for the light "6"

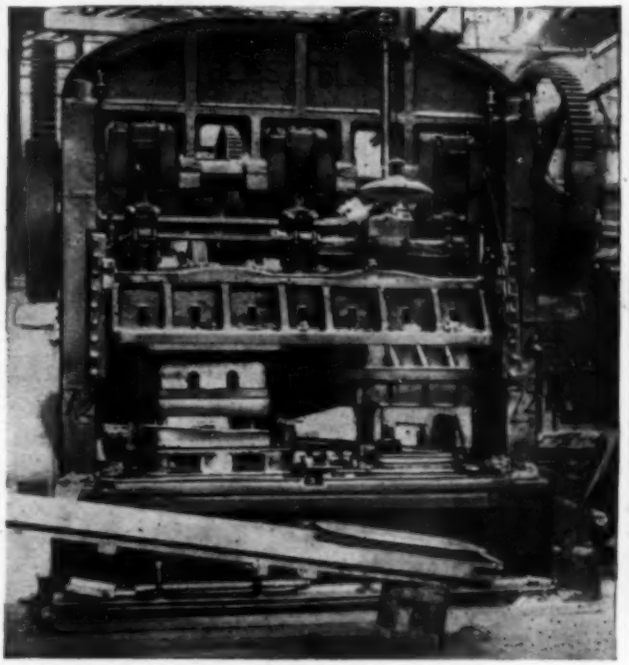


Fig. 2—Many of the die-sets are mounted in pairs in triple-crank, single-acting presses. Portable, wooden chutes convey the radiator shells between machines.

WHEN the Nash light "6" went into production in the latter part of 1929, a complete new set of dies was constructed to form the sheet steel radiator shell shown in Fig. 1. It is blanked from No. 18 U. S. gage (0.050 in.) steel, and assumes its final form after being worked upon by ten other die sets. The blanking die is simple in construction and produces a blank oval in shape with a major axis of 43⅜ in. and a minor axis of 29 in. On account of this size, the shearing edges of both the punch and the die are made up of fourteen tool-steel sections, each screwed and doweled to the cast-iron plates. The knockout in this die is made of boiler plate and is supported on eighteen studs backed up by helical springs.

Except for the blanking operation, the remainder of the presses in the series are grouped together for convenience in handling the shell between operations. In fact, the shells are slid from one press to the other down wooden slides, which form a conveyor system that is simple and cheap in construction, yet adequate for the job. Should another set of dies be put in these presses and the work vary considerably in dimension from the present shell, all that need be done is to knock the wooden forms apart and reconstruct them at a nominal cost for labor alone. Fig. 2 shows one of these wooden slides leading from the first drawing operation to the press in which the shell is trimmed and then redrawn. Blanked sheets, however, are piled on skids and trucked to the first drawing die.

In Fig. 3, details of construction of this die are shown. While there is nothing unusual in its design, certain features should be noted. One of the interesting points is the selection of materials. For the upper half, which is mounted necessarily in a double-acting press, the punch is of semi-steel, while the blankholder has a 3-in. nickel-iron face screwed to a cast-iron base. For the lower half, the base is of semi-steel, instead of cast iron, and has a 3¼-in. nickel-iron face screwed to it. Semi-steel is used for the lower blankholder, which is supported on a pneumatic cushion in the usual way. Incidentally a punch of the same dimensions as used here is also employed for the redrawing operation, which follows after the shell is trimmed.

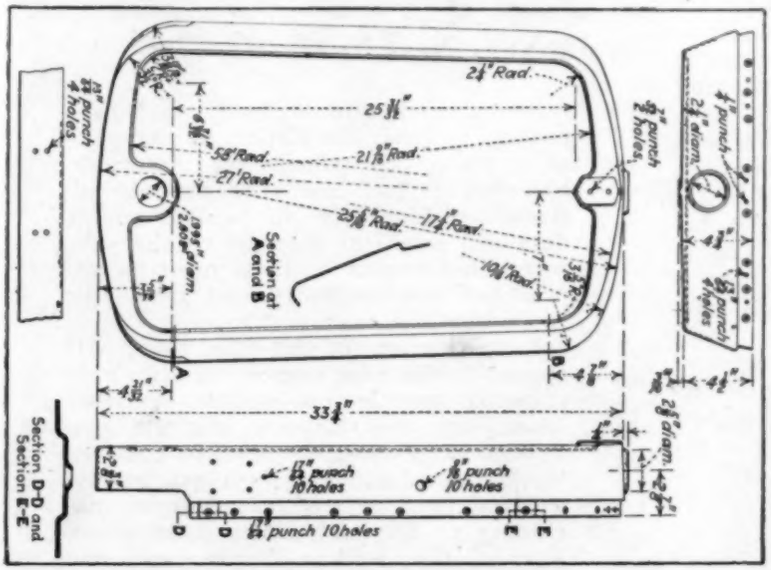


Fig. 1—The radiator shell for the Nash light "6" is drawn from 18-gage steel. Several ingenious die-sets have been developed for forming it

Redrawing is necessary because of the way in which the trimming operation is performed. In the first draw, not all of the sheet is drawn into the shell, a part being left in the original plane as a turned-over edge, about ¾ in. wide. The purpose of this procedure is to simplify the trimming operation that follows. Ordinarily a complicated and expensive wobble shear would be necessary to trim the sides of a shell of such irregular shape, but by trimming the flat edge with a simple die and then redrawing the sides parallel, the same result can be accomplished. Later this same part of the shell is inset to form the hood ledge in which the lace holes are punched.

This trimming operation takes place in the

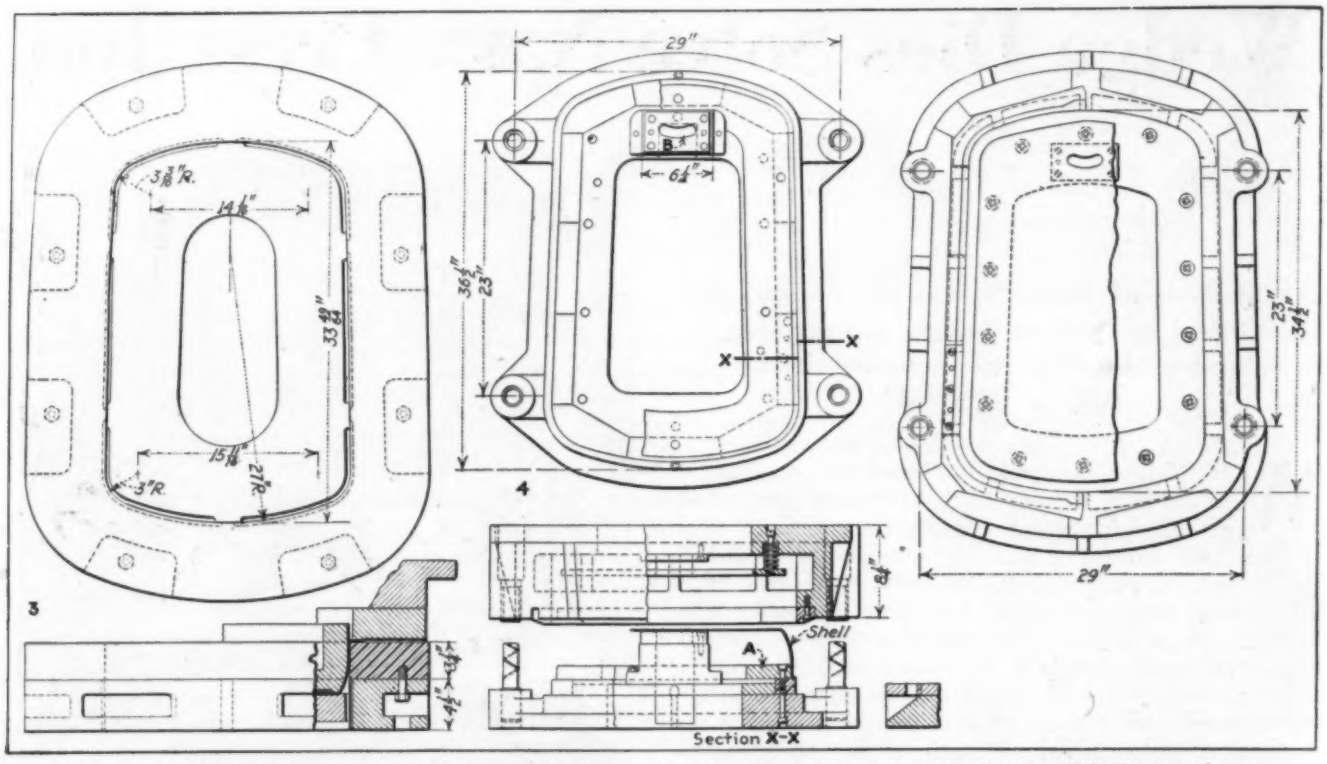


Fig. 3—The initial drawing operation is performed in a double-acting press, the only one in the group, with the die-set shown. Both the blank-holder and the lower die are faced with Elfur iron. Fig. 4—By leaving a turned-over edge in the first draw, trimming it in the simple die-set shown, and then re-drawing the sides parallel, the use of an expensive wobble trimming die is obviated. The hole near the top of the shell is to relieve the metal for a later operation

first of two dies mounted in a triple-crank, single-acting press, shown in Fig. 2. In this view, the trimming die is shown at the right. Fig. 4 shows constructional details. Attention is called to the method of building up the shearing edges by a series of short tool-steel blocks, none of which are over 8¼ in. in length. Positioning of the shell is by the cast-iron plate *A* mounted on top of the lower shear blocks. Here, both sub-bases are made of cast iron because of the light load imposed. The purpose of the upper stockholder, which holds the shell against a pedestal block at one end, is to act as a stripper plate while a crescent shaped hole *B* is perforated in the piece. This hole is in a part of the shell that is later blanked out for the radiator core. Its purpose at this stage of completion is to relieve the metal for an embossing operation on the nameplate shield that takes place during the redrawing operation, next in order.

It was mentioned that the same size of punch was used in this second draw as in the first. There is, however, a tool-steel embossing die inserted at one end that was not present in the first case. Another difference is that this punch is inserted in a single-acting press, and no upper stockholder is required. Pneumatic cushioning is still used as before, however, on the lower stockholder. Embossing is to a depth of 0.200 inch.

In the next operation, the first of several types of wedge dies is called into use. Fig. 5 shows the constructional features. The purpose of the tool is to expand the sides of the shell and form the hood ledge at the outer edge. To accomplish this, the die set is made in three parts, with two sets of slides and two sets of wedges. It is used in a single-acting press, although the punch plate actually carries the two sets of wedges, a hold-down plate, and one set of expanding slides. The lower die carries only the ledge-forming, sliding die blocks. The illustration shows the punch plate proper at the right with its two sets of wedges. Its other half, to which it is attached by the two studs *A*, is shown in the position it would occupy in the lower die when full down and expanded.

In operation, the shell is placed in the lower die, the punch plate descends, and when fully seated, the wedges come into action and force the punch slides out and the die slides in. Springs return the slide blocks to normal. Four slide blocks are used in the punch plate. Two of them are of dog-leg shape, and each of these expand half

In the Very Next Number—

Ever since President Hoover called attention to "the stimulation of exports" as a means of stimulating American business, it has been the purpose of *American Machinist* to publish sound data and practical thought on the subject. That export business must be approached cool-headedly and rationally is axiomatic.

In furtherance of this plan, there will appear in the next number another outstanding article on export, entitled "Assaying the Export Market," by George R. Woods, Manager, R. S. Stokvis & Sons, Inc. This firm will be recognized as a veteran exporter of machinery to England, Holland, Belgium, France, the Balkan States, and the Dutch East Indies. Mr. Woods, himself, needs no introduction.

the top and one side of the shell. The other two blocks expand the lower corners. It is not necessary to expand the bottom of the shell. As can be seen in Fig. 5, each of these blocks travels at a right angle to each other and at 45 deg. to the major axes of the shell. The larger blocks are guided by three tongues and grooves and are actuated by three wedges with tool-steel faces bearing against similar contact pieces on the slide. Only one tongue and groove and one wedge plate, on the other hand, are used for each of the smaller blocks.

The amount of travel of these slides is governed by the angle of the contact plates, 15 deg. for the top ones, 10 deg. for the side ones, and 30 deg. for the bottom pair.

Eight wedges carried on the punch plate proper actuate the forming tools for the hood ledge. These wedges are made of cold-rolled steel, and they bear directly against the tool steel slides, which do the actual forming. On account of the lack of rigidity of these long wedges, hardened reaction plates are provided. A tongue and groove guides each forming tool, just like the expanding tools, and helical springs return the blocks to their normal position. Similarly, several spring bolts are employed to return the inside blocks to normal. The four at the bottom pull parallel to the direction of motion, while the one at the top pulls the two large slides together as they recede toward the middle.

Just as with the trimming and redrawing dies shown mounted together in Fig. 2, so also this wedge die is mounted on the bolster plate of the same type of triple-crank press with a second die in which the central part of the shell is blanked out for the radiator core. As with the first blanking die, the shear blades on the punch are made in twelve pieces, for convenience in heat-treatment, and are screwed and doweled to the cast-iron punch plate. Similarly, the lower shear blades are made in a like number of sections, but are faced with a cast high-chromium steel for durability. Fig. 6 shows a cross-sectional view. In addition to blanking out the central portion, the same punch perforates the crank hole in the bottom of the shell and two rivet holes, 0.220 in. in diam., in the name plate shield embossed at the top. The crank hole is made 1.812 in. in diam., and in a later operation a 2-in. punch is run through it to round the edges.

Another interesting type of wedge die is shown in Fig. 7. It was designed to punch 28 lace holes, 10 saddle holes in the sides, and 6 other holes in the upper part of the hood ledge, besides 2 lamp conduit holes in the sides. To do this, thirteen slide blocks in the die and as many wedges in the punch plate are required. Each slide block is mounted at an angle corresponding to the slope of the shell at that point. They are all made of semi-steel faced with machinery steel punch holders, but with no wear plates to receive the wedges. All but the three slides on the upper corner on each side, slide between guides with overhanging lips. On account of space limitations, these corner blocks are guided by T-slots and guides in the middle.

The simplest form of equipment is all that is needed to emboss the shell at the top and to perforate the raised portion for the filling hole. Both these operations are performed in small punch presses of the horning type with a simple stake for support of the piece. The piece is steadied by hand in a vertical position, the one it would normally occupy in the car chassis.

Notching of the shell at the bottom is the final press operation, performed in two steps. As in the previous case of the trimming operation, by using two fairly

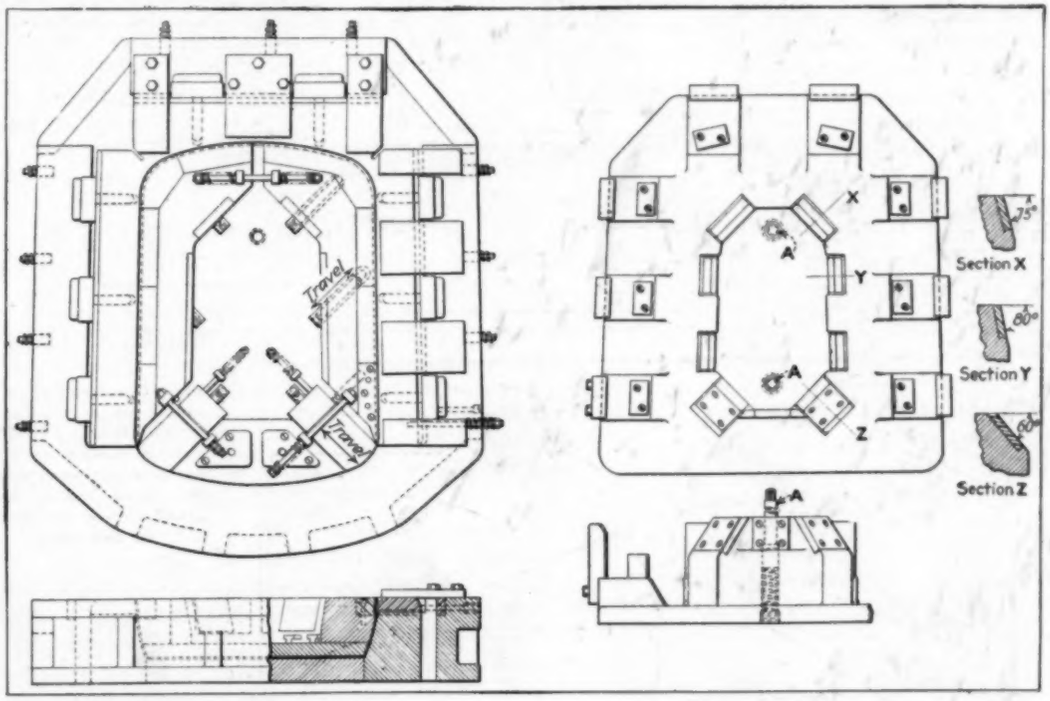
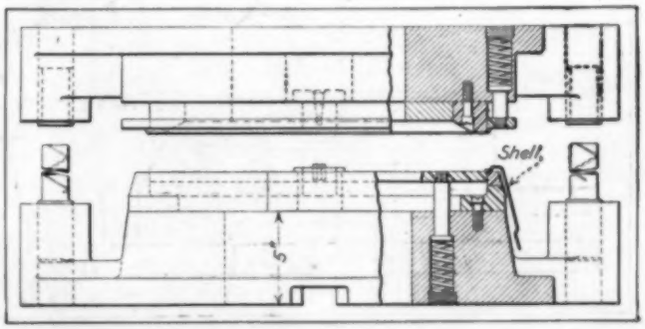


Fig. 5—In this die, the sides of the shell are expanded and the hood ledge formed. By making the punch in two parts, one carrying two sets of wedges, the other a set of expanding dies, the work can be done in a single-acting press

Fig. 6 — Cross-section of the die in which the central portion of the shell is blanked out for the radiator core and the crank hole perforated



simple dies, the expense of making a more complicated wobble die is avoided again. Fig. 8 shows the first die, in which the two lower corners of the shell are notched, while Fig. 9 shows the construction of the second, in which a strip of the bottom is cut out. Both dies are of the wedge-action type, and for convenience in handling the shell, both are mounted on the bolster plate of a triple-crank press. Helical springs return the slides to their normal position in the usual way.

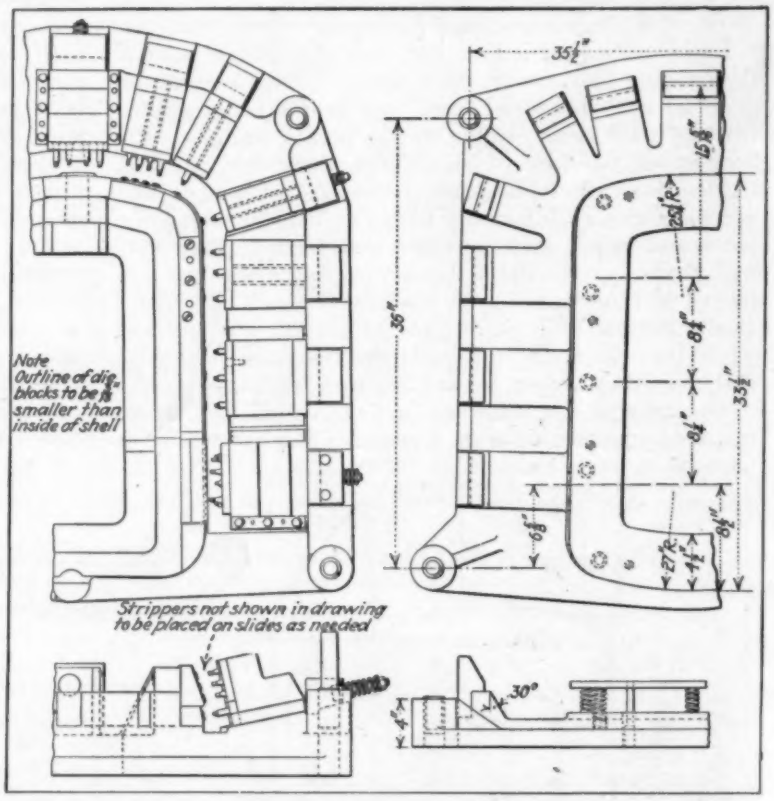
In operation, the lower part of the shell is slipped over the die, is pulled back into position by the operator, and is held there during the notching operation. As further assurance that the shell is in position, a leader plate *C* mounted on the punch plate bears against the shell during the descent of the punch. In addition, a hold-down plate, made of ½-in. boiler plate, comes into action. Its primary purpose is to act as a stripper plate while the previously punched crank hole is being dished inward by punch *D* to round its edges.

Two steel wedges are mounted on the punch plate, each actuating a slide carrying the shearing tools for each corner. Stripper plates, shaped to the contour of the shell, are necessities; they may be seen mounted on the tool-steel punches.

A somewhat different type of die is shown in Fig. 9. The punch is exceedingly simple in construction in that its only function is to support the two steel wedge bars which are held to it by two ½-in. capscrews. There is only one slide block in the die. It is made of semi-steel, 18¾ in. wide, and carries two complementary tool-steel shear blocks, besides four small punches held in a steel holder plate. The corresponding shearing edges on the fixed portion of the die are made in five sections on account of the difficulty of heat-treating the whole unit. The wedge surfaces of the block are cut directly in the casting, but on the die plate the pedestals that take the wedge reaction are faced with tool steel. Three helical springs return the slide to normal. Guiding is by a T-slot in the middle and a tongue and groove on each side.

This is the final press operation on the shell, which is now ready to be washed and plated.

Wedge dies have been used for many years, and are still generally used for expanding, compressing, and bending small parts. They are also used for perforating shells and similar parts that must be punched at several points, or from the inside. Since the applications herein



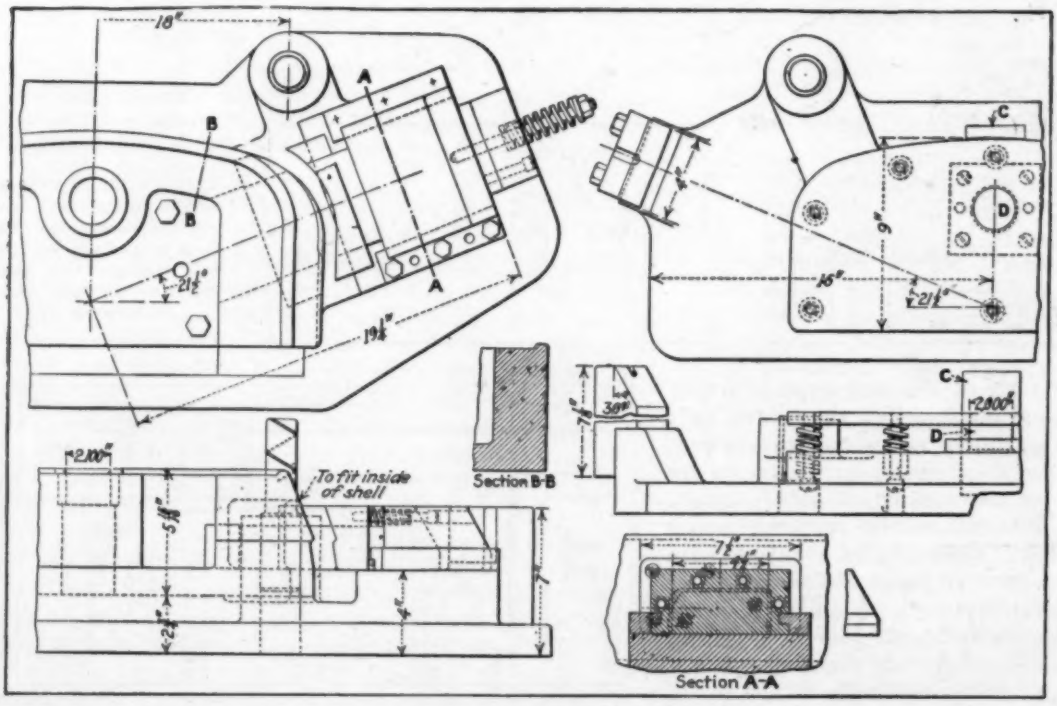


Fig. 7 — Another example of a wedge-action die. In this case, a number of lace holes are punched in the hood ledge, and bracket holes are made in the sides

Fig. 8—In this wedge-type die, the corners of the shell are notched. The work is held in place by hand, but the leader plate *C* assures that it is properly positioned. A stripper plate is required because of a punch tool used to enlarge the crank hole

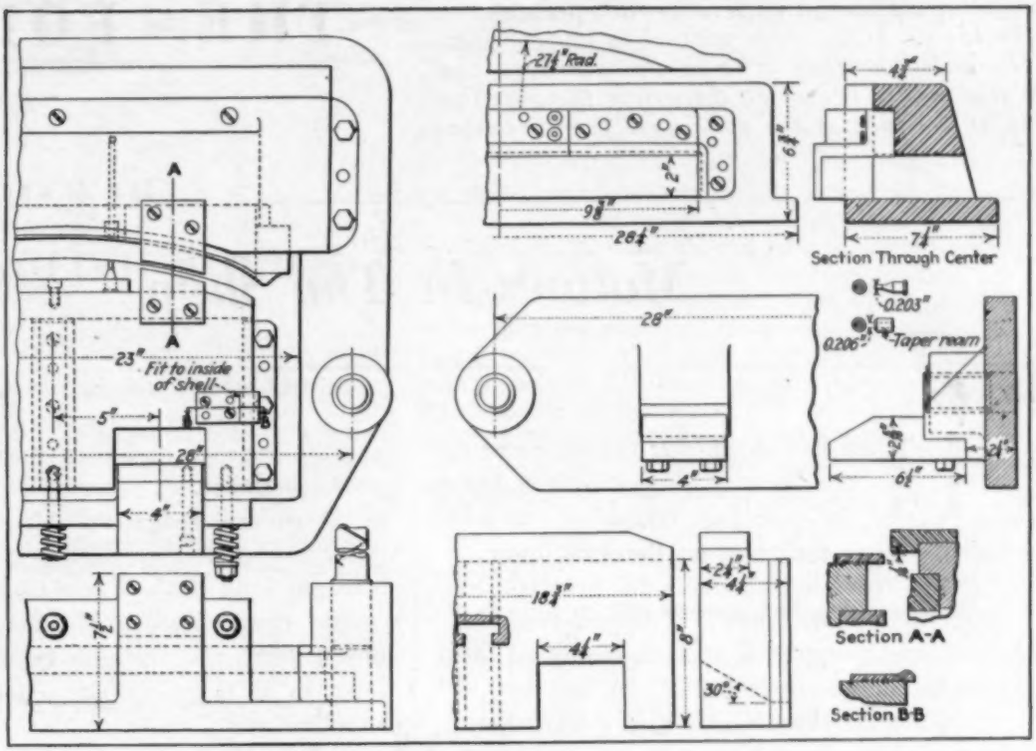


Fig. 9—This final wedge die is paired off with the one shown in Fig. 8. Both are mounted on a single bolster plate. This die completes the notching of the bottom of the shell. Only the two wedges are carried on the punch plate

described are on a larger scale than usual, some difficulties are encountered that do not arise in small work.

One of the operations is also noteworthy in that the action is complex, the punch sections being forced outward to expand the body, while the die sections are forced inward to form the ledge. This latter is necessary, because the shape of the shell prevents its being withdrawn from the bottom, and it must be removed through the top. The upper edge of the die must, therefore, be out of the way.

Making Safety Rules, and Enforcing Them

By Leslie Childs
Attorney-at-Law

GENERALLY speaking, safety appliance and workmen's compensation statutes provide that an employer shall not be liable for injuries suffered by employees because of willful violation of safety rules. In other words, if an employer furnishes safety appliances and orders their use, employees are in duty bound to obey orders or impair their rights to damages for injuries suffered while disobeying the rules.

It is equally well settled, however, that an employer may lose all right to exemption from liability in cases of this kind by failure to enforce rules of his own making. By the same token, the mere issuing of safety rules, by bulletin or otherwise, may not entitle the employer to the protection of the statute if he tolerates open violation of the rules he has made.

As an illustration of the rule and of the possible danger in overlooking it, the Wisconsin case of the Milwaukee Corrugating Company vs. Winters is cited.

In this case, the company operated a plant in which there was a battery of six drop hammers, each equipped with a device, consisting of a leather strap fastened to the hammer on one end, and on the other, to the arms of the operator in such fashion that the hand of the operator was jerked into the clear when the hammer dropped. Winters, a drop-hammer operator, had been instructed, along with the other employees, to use this safety device. But, since it caused him discomfort and since no one forced him to wear the guard, he habitually worked without it.

One day, in working without the guard, the operator's left hand was crushed. He was awarded compensation for his injury, and the corrugating company brought suit immediately to have the amount of compensation reduced on the ground that the injury was caused by the willful failure of the operator to obey the safety rules. It was brought out at the trial that, though the foremen usually reprimanded men caught working without the safety device, no operator had ever been discharged for failure to use it. Violation of the rule appeared to have been tolerated. The court, in rendering its decision, interpreted this attitude as amounting to tacit consent on the part of the employer, and declined to reduce the compensation awarded.

The books show case after case in which employees who suffered injury through failure to wear safety appliances have given "discomfort" as their reason for not wearing them. While this excuse in itself may not relieve an employee from the penalty of disobedience, if it is coupled with a lack of insistence on the part of the employer, the combination may permit the injured person to win his case. In other words, a breakdown in the enforcement of shop and factory safety rules made in compliance with a statute to prevent accidents and protect the employer from liability for injuries arising through willful disobedience of such rules, may nullify the statute is so far as protecting the employer from liability is concerned.

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions given at the foot of the page have been arranged

Mottoes In The Shop

"HELLO Ed, old scout, welcome to our town. Where've you been for the last couple of days?" hailed Al, as they met on the way home.

"Oh, travelling around to broaden my education. You know, Williams said that we should bring back at least one good idea with us, or not come back."

"Not quite that, but he said a man should know more when he returned that he did when he left, if he had both his mind and his eyes open. Where have you been, and what is your one idea?"

"If you are done kidding, I'll tell you. In one of the shops where I was, I saw posters all around the shop, and in some places there was a quotation from an imaginary John Smith. This guy says, one week, 'Waste lowers your wages,' and the next week he says, 'Unharnessed power is waste.' And he backs these slogans with appropriate pictures."

"For the love of Pete! Why didn't you tell those people the war has been over for at least ten years?"

"Sure it has, but look what those posters did during the war. They made us think, and they made us willing to fight, and there's no reason why they shouldn't be just as effective now."

"Right you are, they'll make any man want to fight now, just as they did then. The average mechanic, Ed, is a reasoning being, and he resents anything that is obviously propaganda."

"It isn't propaganda, Al, it's good stuff. All the foremen voted for it when the big boss put it up to them to decide."

"Of course they did! Why should they object when the big boss sponsored it? As long as it is doing no actual harm, they should worry."

"Well, Al, I'm keen for it, and I am going to try Williams on it. It was the best thing I saw while I was away."

"Well, maybe you had your eyes open, but I can't figure where your mind was."

"I can, because I was thinking at the time, and I still believe that such notices help to make a man think."

"Yes, but what? I'll tell you, Ed; get Williams to have some neatly printed signs painted, with appropriate extracts from the laws of manufacturing and mechanics, and hang them where the foremen can see them too."

"But we foremen don't need them, Al."

"No? Suppose every time you came out of, or went into your office you saw the law of leadership staring you in the face, wouldn't it make a better foreman out of you?"

"If anyone did that, I would consider it a personal affront."

"Certainly, and some of the men would resent posters in the same way."

Do such notices do good, or are they resented? Is the opinion of people who can be influenced by obvious propaganda of much importance? Are instructive mottoes of any value?

Contributed by C. Norman Fletcher, Cheshire, England

All foremen are urged to discuss these questions vital to their work; of course the

DISCUSSION OF EARLIER TOPICS

Advising Employees About Their Affairs

I HAVE known many instances where men have found themselves worried by difficulties, and have lost time in order to seek advice. Eventually, becoming disgusted, they have preferred to quit their jobs rather than try to square themselves by telling their troubles to the boss.

This is one of the reasons why a welfare department has proven to be a factor in production. Such a department, headed by a man with a keen insight into human nature, who, by friendly contact with the men, is able to give them impartial advice, ofttimes forestalls such troubles as might interfere with their equanimity. Activities of this nature carried on with a view to advising workmen on matters of health, or legal troubles, are very desirable, and tend to elevate the employee, giving him a better outlook on life. From a selfish standpoint it always pays dividends to the employer, in the goodwill of employees, in lower costs of production, in less scrap, and in lower labor turnover.

Those opposed to paternalism used to argue that a man could take care of himself if he received enough pay. When living was a simple matter of getting enough money to pay for food, shelter, and clothing, there may have been some truth in this. In our present complex civilization it is practically impossible for an employer to run a business without having to call for assistance occasionally from an engineer, accountant, or attorney. Are not the problems of raising a family, a business on a smaller scale? And is it not obvious that if such difficulties as those with which a workman is confronted are lightened by expert advice, the result will be more contented employees and a more profitable business? —W. E. HAMILTON, *Industrial Engineer.*

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A Bonus for the Ambitious

THE danger of losing, or spoiling a good craftsman cannot be considered as an excuse for not recommending or encouraging young men to prepare for the future. In order to be a good mechanic, a man needs more education than that of the average shop-worker. Also, the numerous supervisory jobs demand men better than ordinary workers, yet less trained than those who have been through a technical school. This field holds attraction for many men who realize that they are not qualified for positions higher up.

—L. F. SWENSON, *Industrial Engineer, Perkins Machine & Gear Co.*

Compulsory Membership in the Mutual Aid

SHOULD joining the mutual aid be made compulsory? Yes, and for a good reason. The average man does not carry sick and accident insurance, not because he does not realize the value of it, but because he just doesn't bother about it. Then when the time comes that he needs it, he regrets not having taken it out.

Here are some of the reasons advanced in favor of this plan, by at least 80 per cent of the employees in shops I have worked in that have this system.

1. "The cost being deducted from the pay check, we never miss the money because we don't handle it, and do receive it when our need is greatest." 2. "The company is behind this insurance, and if we are entitled to benefits, will see that we receive them." 3. "If I don't collect any insurance, I am helping someone else."

As one employee expressed himself, "I will gladly do the paying if the other fellow does the dying."

—H. H. VINCENT.

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Tempering General Purpose Tools

THE proper tempering of tools requires great skill. Two men will apparently go through the same operations and do exactly the same things with similar classes of work, but the man having the greater skill will get better results. Good instruments and equipment are a help in producing a good product, but the personal element will have an effect on the final answer. The instruments must be used with common sense and good judgment, and cannot be solely relied upon. A skillful man will use whatever equipment is available and get results, but the ordinary man does not know the fine points in heat-treatment, and his work is poorer.

—L. O. BROWN, *Toolroom Foreman, Holcomb & Hoke Manufacturing Company.*

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Games at the Noon Hour

IT IS advantageous to the men, the shop, and the firm, to encourage and assist in the matter of games and sports after work hours in the evening. These will get a proper spirit into any shop, if carefully handled. The firm that can arrange for such sports can be sure of adding a valuable asset to the plant.

As a foreman of many years standing, and as one who, during the last five years, has assisted in organizing the sports of the firm for which I work, I believe the resultant good spirit and comradeship is worth all the time a foreman can put into it. Noon hour games, however, will very soon transform the shop into a sporting club with a premium being paid for working in it.

—A. M. GRIGG, *Newark-on-Trent, England.*

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Paying for Dependability

I DON'T believe that the dependable workman always gets proper recognition. For one thing, the dependable man is very often a less aggressive type than the self-assertive and less dependable chap. The good old

discussion is not limited to foremen. Letters accepted and published will be paid for

dependable chap will often be kept on the same job, at the same pay, for years, while the aggressive, noisy fellows forge ahead.

The dependable man, who requires little or no supervision, is worth more money than the man who takes a lot of the boss's time.

I know of a manufacturing department full of young aggressive producers, many of whom lack experience. They are hustlers because they want a fat pay envelope, and not because they like the work or their foreman.

Another department in the same plant is presided over by a quiet, methodical man who has built up a department of men 30 years of age or older, many of them middle aged men with families, who own their homes. Some of these men are not as fast producers as the men in the first department, but they stick to their jobs, require little supervision, and the labor turnover is very low. The foreman enjoys his work because the department runs smoothly, his men are congenial, and he has plenty of time to plan the work, and put jobs through in scheduled time.

The first foreman, on the other hand, is so tied down by details of supervision, setting-up jobs, and instructing new operators, that he has little time to do any constructive planning. This man is working himself into an early grave, simply because he lacks dependable help; but like Ed, he thinks that only production counts.

There are not enough really dependable men to go round, but let's reward the few we have and recognize their dependability as an asset to the company.

—H. M. DARLING, *Engineer, Wells Tap & Die Company.*

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What You Do or What You Get Done?

WILLIAMS' statement that what really counts is what you get done, not what you do yourself, was about the wisest that could have been made to a foreman like Ed. It hurt, but it also healed by putting Ed on to a better policy.

The first duty of a foreman is to plan that every man in his department has ample work and sufficient information to do it in the most economical manner; next, to see that each man does it in the most economical manner.

Having attended to that, he should study his men and discover their weaknesses and strengths. Then he should arrange both the work and his men to take advantage of their strengths.

To do this he will need to be a practical psychologist and to have the courage and initiative to experiment and to continue experimenting. He will have to be prepared to change the position, the work, the method of treatment of each individual, until he finds that combination of all these, which draws from each man his highest production.

Striving for that in any department of considerable size will so amply fill the foreman's time that he will have little, if any, left for working with his own hands. But he will be using his brains and character to work with all the hands of his men.

—JOHN J. WOFFINGTON, *Warwickshire, England.*

WHEN a man is in charge of a team, with all the best will in the world it requires more than his own effort if the best is to be achieved. It has to be a case of each member of the team pulling his weight with the other members of the team. That is where the true leader shines. He superintendends and he arranges everything to the best advantage, so that there shall be useful work done efficiently.

It is usually a mistake for a foreman to do too much "work," as distinct from the oversight and planning of the work. The main thing is to urge forward the production. This is best done by getting each man usefully employed. Indeed, it takes quite a big toll of a foreman at times, to arrange the work of his team so that each one shall be kept at the job he is best fitted for. Time spent by men waiting for instructions may be considered a sure "pointer" that the foreman has failed in efficiently organizing the work of his department. No amount of personal work—work that should be done by any one of a number of men under his charge, can compensate for the lack of the co-ordination which is a vital factor in successful production.

—W. R. NEEDHAM, *Stafford, England.*

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THE · NEXT · TOPIC

"Why Conferences, Anyway?"

Raising the Working Efficiency

SUMMARY OF THE DISCUSSION

Ed paid a visit to a shop in another city, and found that they employed instructors in the shop for both men and boys. Ed resented the idea of anyone usurping the functions of the foreman by giving instructions to his men, but Al pointed out that possibly it would be a good idea to carry the plan further and have instructors for the foreman.

THERE still remain many points to be worked out in shop education, one of the queer things about placing instructors in the shop being the fact that the greater the need of an instructor, the more resentment is shown against his presence.

A man must continue to learn during his whole lifetime, and the best educated man is the one who makes the most consistent progress covering that period.

The change from the one extreme, of loading the foreman with every shop function from teaching to time study, to the other extreme of depriving him of most of his functions, has rather confused him, and he shows this confusion by resenting any further change.

An efficient shop executive states that he does not want a shop instructor, because he has made himself the instructor of his foremen, and expects them, in turn, to instruct their men.

It seemed to be the consensus of opinion that, in some types of shops, instructors are desirable and, in others they are not. Possibly, like other innovations, "this too will pass away," and out of the experience a well balanced instruction practice may evolve.

ODDS AND ENDS in a Railroad Shop

Devices in use in the Chicago shops of C. & N. W. Railroad both to save time and to increase accuracy

By H. P. LEONARD

INCREASE in shop efficiency and in accuracy of work has been obtained in the shops of the Chicago & North Western Railway Company through the use of many unusual tools and fixtures developed in the shops. In many instances the simplicity of the device is its chief recommendation.

The two gages shown in Fig. 2 are examples of what can be done to facilitate building up worn surfaces by welding. On the table is a trailer spring yoke, the ends of which have just been reclaimed by acetylene welding. Metal is deposited on the faces of the yokes until the gage shown laying on top of the piece, will just slip over the ends. Welding is used in making the gage itself out of angle iron and flat plates.

Similarly, the bosses on the locomotive frame that engage the yoke are built up by welding, with the aid of the internal gage shown on the floor in the same figure. Pipe is used for the back-bone of the gage in this case, and one of the members can be slid along the pipe and locked in one of two positions, corresponding to the two sizes of locomotives on which this construction is employed. No adjustment is available on the first-mentioned gage, and therefore, two of them are required.

If the yoke pin holes are badly worn they are filled up solid by the welding torch and are afterwards drilled. In this drilling operation, performed with a radial drill, it is essential that the holes at each end be in line with one another. To assure this condition, the simple fixture shown in Fig. 1 has been devised. It consists essentially of a 4 x 4 x ½-in. angle iron, 71 in. long, planed on both sides on the outside, but left unfinished on the inside. The bottom end of the angle iron is filled by a square piece, welded in place, on which one end of the trailer yoke rests. The two legs of the angle act as a V-gage to center the end. As the photograph shows, the angle iron is bolted to the side of the drill table, and the yoke is clamped to the same table by means of a U-strap, its ends being located against the angle iron. The piece being drilled is supported against the tool thrust by a screw jack resting upon an arm bolted to the angle iron jig. The upper end of the yoke is steadied in a lateral direction by a thumb clamp bolted to an upright, which, in turn, is bolted to the drill table.

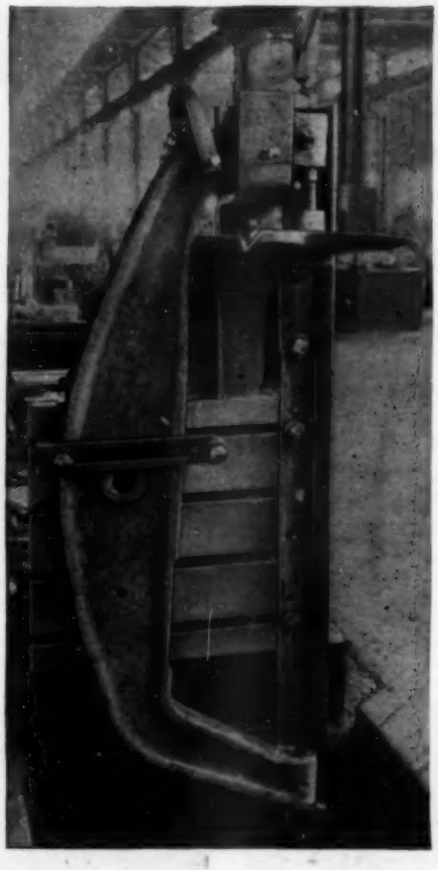


Fig. 1—Simple jig for drilling trailer yoke ends in line. It consists essentially of a length of angle iron planed on the outside and bolted to the machine table

Correct functioning of the Walschaert valve gear depends to a great extent upon the proper alignment of the links when assembled. It is particularly important, therefore, that no springing take place in any of the parts while they are being machined. Otherwise, when the pieces are bolted together, important parts, and the trunnions in particular, are likely to be thrown out of line. Fig. 3 shows how one side of the link is refaced at the bolt holes in a Diamond face grinder, while Fig. 4 gives a better idea of how the trunnion is carried in the fixture in double V-blocks. This arrangement assures the faces being square with the axis of the trunnion.

The ends are backed up by setscrew heads so that displacement from the grinding pressure is avoided, and setscrews, top and bottom, hold the piece securely against rota-

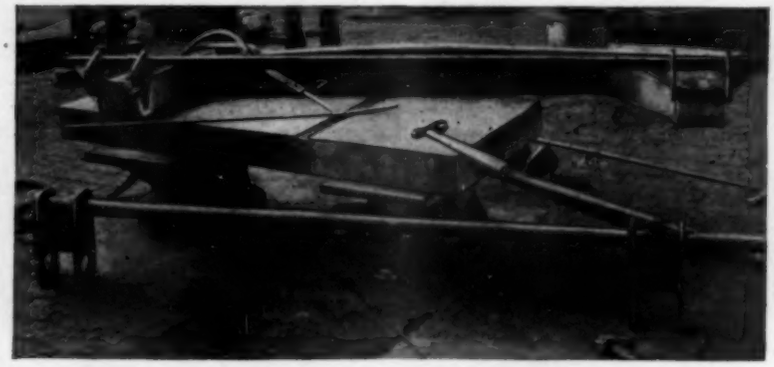


Fig. 2—Fixtures for use in building up trailer spring yokes and bosses by adding metal with the gas torch. The fixtures themselves are welded

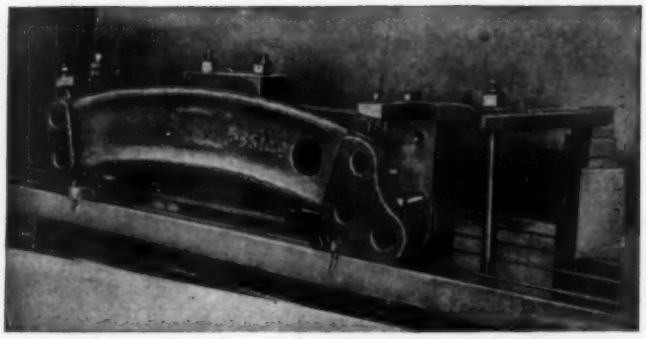


Fig. 3—Trunnion half of a Walschaert valve gear link set up in a face grinder

tion about the trunnion axis and any other movement.

The two trunnion halves and the curved link located between them are clamped together in the arrangement shown in Fig. 5, and can then be handled as a unit, merely by unfastening the holding bolts on the table. In this way the holding fixture can be moved about, and the links can be drilled and reamed and the bolts fitted with the assurance that the trunnions will be in line when the holding fixture is released.

Steam pipe flange casings, which are made in halves and are bolted together to form a steam-tight joint, present another problem where springing must be avoided during the grinding operation. The work is done on the same face grinder as used for the Walschaert links just described, and the same principle of locating by setscrews is employed. Fig. 6 shows the fixture, which, while not an artistic triumph, is effective in its results. Eleven setscrews are provided, but only about half this number need be adjusted when making the set-up. Boiler plate, bent at a right angle, is the material used for the fixture, and the irregular openings in it were cut out with an oxygen torch. In the rear is an additional plate, also carrying a setscrew to steady the overhanging part of the casting against the pressure of the grinding wheels.

At one time forty-seven different sizes and types of guide liners were in use on the various locomotives of the road, as shown in Fig. 7. The widths of slots varied from $1\frac{1}{8}$ to $1\frac{7}{8}$ in., and the depth from $1\frac{3}{8}$ to $8\frac{1}{4}$ in. There was also a wide variation in blank sizes. For merly a separate die set was kept for each liner, and besides the expense of making and maintaining these dies, there was considerable loss in material because of careless blanking of the sheet. Now, one die set replaces all the others, and a somewhat standardized liner is produced. A single width of slot is used, and the end has been made semicircular, but no change has been made in the number or placement of these slots in the liners. Fig. 8 shows both halves of the die. The punch is $8\frac{1}{4}$ in. long and $1\frac{1}{2}$ in. thick, and will therefore take care of the longest slot. Location of the slot is attained through the medium of adjustable guide bars, one at the top, the other at the left. It is possible to set these guides at an angle where such is necessary.

Practice has been reversed in that the liners are cut first on shears, so that waste material is held to a minimum. Where, before, one stroke of the press completed the job, it is now, of course, necessary to use as many strokes as there are slots, and it is necessary to reset the guide bars, but these disadvantages are so outweighed by the larger savings resulting from the use of a single die set that they become insignificant.

Air reservoirs, after being tested and repainted, are

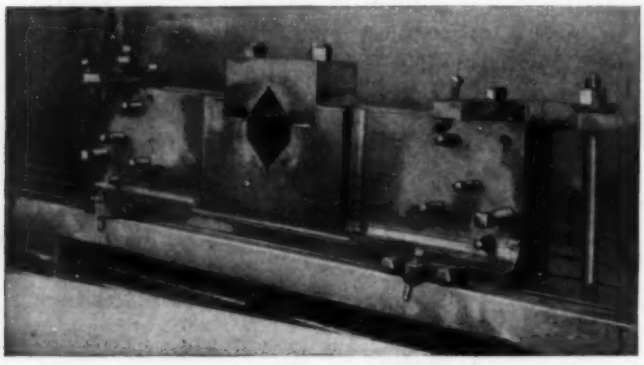


Fig. 4—Details of the fixture for clamping the trunnion and holding the ends of the piece by means of setscrews

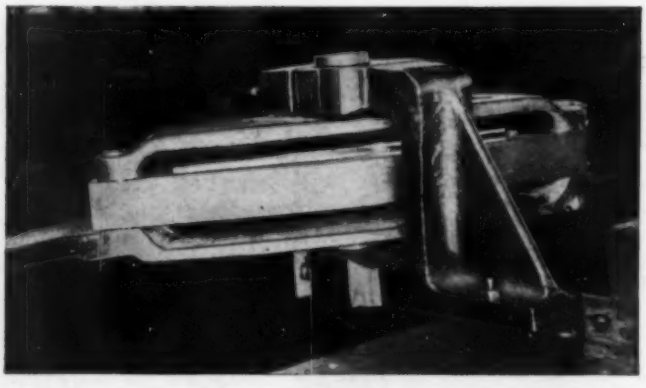


Fig. 5—Device for assembling Walschaert valve links at the bench wherein the entire device and link can be moved to the drill press or lathe for drilling, reaming, and fitting of the bolts

Fig. 6—Fixture for supporting an odd-shaped casting during a face grinding operation. With the setscrews placed as shown springing of the piece is avoided, and positive clamping is assured

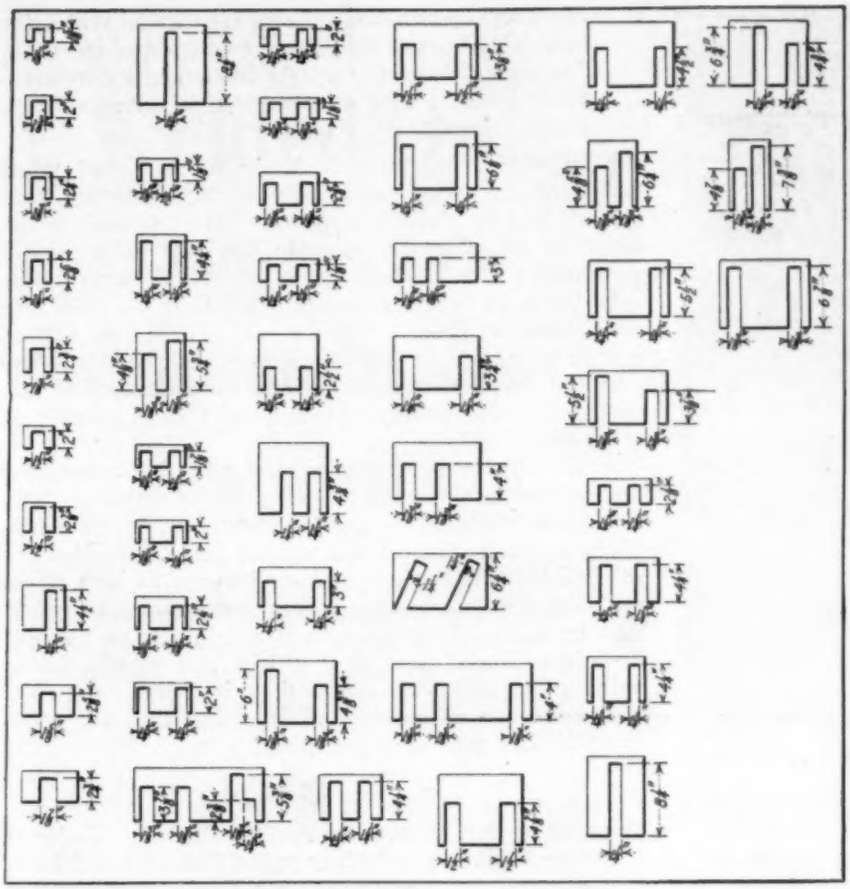
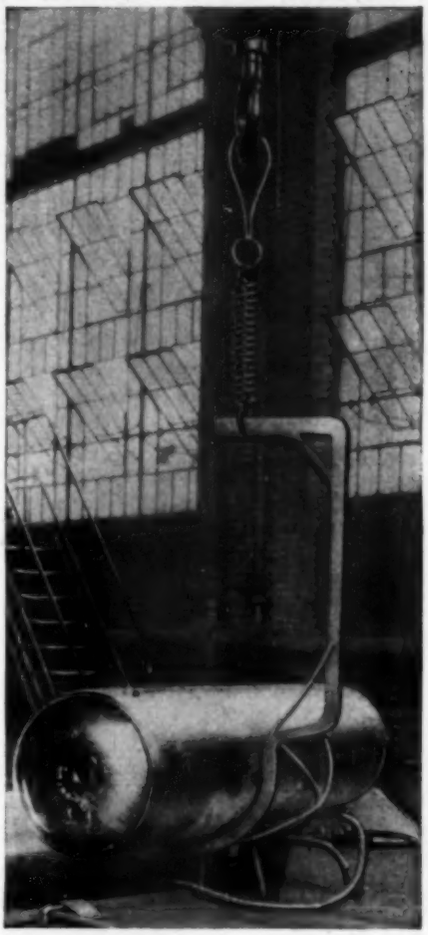


Fig. 7—Wide variety of guide bar liners that were formerly used, each necessitated a different die set (B/PC-15549-A)

Fig. 9—Below—Cradle for assembling air reservoirs under the running board of a locomotive. A steady upward pressure can be applied through the helical spring without danger of ripping the board off through shock



put back in place under the running board of the locomotive with the aid of the special cradle shown in Fig. 9. The device is suspended from the regular crane hook through a spring connection so that the tank can be held in place under pressure while the holding bands are being tightened without danger of wrecking the running board. By offsetting the arm of the cradle as shown, the center of gravity of the tank is brought directly in line with the crane hook.

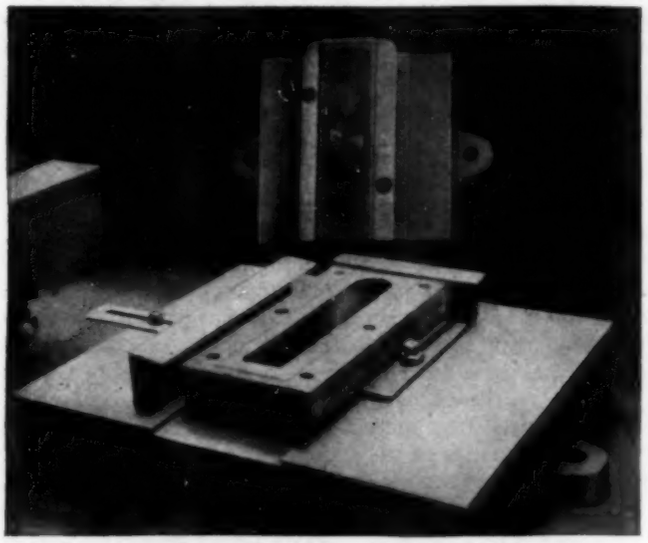


Fig. 8—Above—Die set now used to perforate all guide bar liners. A uniform slot width of 1¼ in. is maintained, and the location of the slot is determined by the position of the guides at the top and to the left

These and other refinements of shop practice, none of which is of much importance in itself, lessen the shopping time of a locomotive, and incidentally decrease the labor cost. The aggregate of these various savings, over the period of a year, is considerable, and means a substantial economy in operation.

Wanted—Satisfactory Tests for Cadmium Plating—*Correction*

By Karl A. Eckhardt

CERTAIN slight errors in the article on page 995, Vol. 71, of *American Machinist*, might be misinterpreted. On page 995, four lines above the cut, and again in the right-hand column directly opposite the bottom of the cut, the word "chromium" was inadvertently substituted for "cadmium." They should not be confused since they represent entirely different metals. On page 997, in the third line of the left-hand column, the words "starting point" were substituted for "end point." The end point is the conclusion of a chemical reaction or test. In a salt-spray test, the first breakdown marks the conclusion or end point.

· BOOK · REVIEWS ·

CONDITIONAL SALES. *By Roger Sherman Hoar, commercial attorney. Five hundred twenty-one pages, 5¾x8½ in. Indexed. Published by the Ronald Press Company, 15 East 26th St., New York, N. Y. Price $10.*

PREPARED by a man who has had an unusual opportunity to know this subject from all angles, this volume offers probably the most comprehensive, up-to-date, and practically useful information available, fully annotated and interpreted. A great deal of the information on conditional selling obtained by the Bucyrus-Erie Company, the company for which the author is attorney, through years of bitter experience, is used in this text.

The book contains valuable information on the latest legislative enactments and court decisions, in addition to hitherto unpublished information regarding local practice and tactics, to be followed in cases where the law is not clear. With the increasing popularity of the conditional sales contract, this book is essential for proper consideration of all factors involved and for complete protection to both parties to the contract. Three appendices give information regarding important statutes of the individual states, handy forms for use in conducting a conditional sales business, and a guide to collateral reading.

Every known change made during 1929 is included in the volume, and because of the meeting times of state legislatures, the book is complete until the middle of 1931. This is a text written by a man who seems to know and to understand every inch of the ground covered by his book.

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DIE MASCHINENELEMENTE. *By Chief Engineer Friedrich Barth. Published by Walter de Gruyter & Co., Genthiner Strasse 38, Berlin W. 10, Germany. One hundred sixteen pages, 4x6 in. Indexed. Cloth bound. Price 1.5 Reichsmarks (about 36 cents).*

RAPID technical developments in machine design have clarified many features and brought to a high state of development the methods of carrying out design problems. This development has also caused the publication of a vast amount of literature on the subject. Even the elementary works are so extensive that only a cursory reading would require a prohibitive amount of time. Further, they are not readily accessible to everyone. As a result, anyone wishing a comprehensive view of the subject in a short time is faced with almost insurmountable obstacles. In such cases, this handbook will afford welcome help. Profusely illustrated and bound in flexible covers, it makes a convenient pocket volume. It is printed in German.

A task such as this book attempts may seem impossible, but the effort is made only to present a general view and an introduction to the subject. Accordingly, the volume has been confined to fundamentals. Computations are merely indicated, but in some instances will serve for approximate estimates, at least. Technical progress has necessitated an extensive revision in preparation for the present volume.

MARKET DATA HANDBOOK OF THE UNITED STATES. *By Paul W. Stewart, Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington. Cloth bound. Five hundred thirty-four 9½x11½-in. pages. Price $2.50.*

BUSINESS judgment is likely to be sound when based on facts, particularly if the facts are well selected and carefully correlated. This handbook is the result of an effort to assemble for each of the 3,073 counties in the United States, statistical facts indispensable to an appraisement of markets in the profitable distribution of goods. The material is organized so that it may be applied to specific market problems; the selection and interpretation of the data must be done by the user. Available county statistics and a large number of maps are included.

Practically every business man will find something somewhere in the material which is of value to him. Upon the basis of the material contained in the handbook, an evaluation of the market possibilities for the sale of industrial goods and equipment, as well as an analysis of the market for general consumption of goods, may be made. In addition to its usefulness as a source book for market statistics, it will undoubtedly be of value as a general reference, since it contains the most comprehensive compilation of statistical data for counties that has ever been assembled.

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BLUEPRINT READING. *By Joseph Brahdy. Indexed. One hundred ninety-four pages, 9x6 in. Cloth board covers. Published by the McGraw-Hill Book Company, Inc., 370 Seventh Ave., New York, N. Y. Price $2.*

THIS book is a thorough revision of a previous edition designed to teach the reading of commercial blueprints to students and to industrial workers who desire to become proficient in this branch of their work. It is particularly adaptable as a textbook for students in secondary schools. It is profusely illustrated and carefully indexed.

The text is intended to meet the special needs of beginners. At the end of each chapter there are exercises and questions regarding the content. Starting with the elements of drafting room procedure, the text carries the reader through to complex working drawings. The subject of orthographic projections is among those treated clearly and thoroughly.

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HISTORY OF WAGES IN THE UNITED STATES FROM COLONIAL TIMES TO 1928. The book contains 527, 9x6-in. pages with appendix and presents a picture of American wages in representative occupations in representative industries from early Colonial days to the present time. For such occupations it includes as continuous a record as possible of the wages and hours of labor. The character of the material makes necessary the dividing of the report into two distinct parts, Part 1 dealing with the scattered statistics of the period prior to 1840, and Part 2 covering rather completely the period from 1840 to 1928, inclusive. The book has been published by the U. S. Department of Labor, Bureau of Labor Statistics, and is known as Bulletin 499. It may be obtained from the U. S. Government Printing Office, Washington, D. C., for 80 cents.

Welded-On Overlays in Machine Design

By MILES C. SMITH
The Stoody Company, Whittier, California

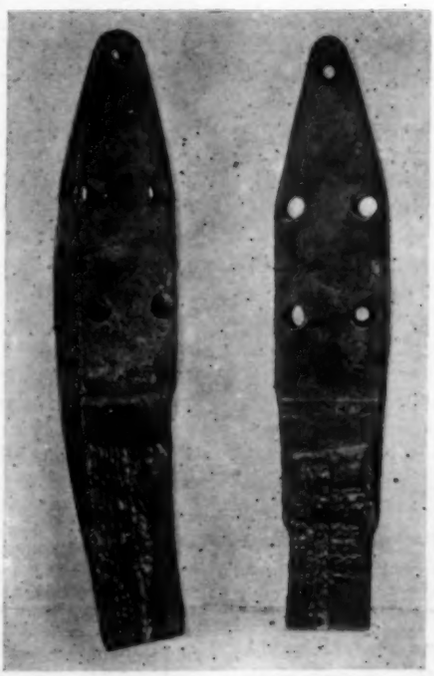
Tungsten carbide and similar materials can be deposited by torch or arc to form local wear-resistant surfaces on machine parts

Welding an overlay of wear-resistant metal on a machine part by a metallic arc

ALTHOUGH there is, at this time, considerable interest expressed in the possibilities of tungsten carbide cutting tools, little consideration seems to have been given to a wider range of uses for welded-on overlays of tungsten-carbide. One particular application for such overlays, which is quite apparent to those familiar with both the characteristics of welded-on overlays and with the fundamentals of machine design is the incorporation of overlays as an insurance against excessive wear and the consequent replacement of machine parts.

Welded-on overlays were first introduced by Winston F. Stoody as a solution to a maintenance problem in the petroleum exploration drilling industry. In the relatively short period of ten years, the process has been developed to the needs of that industry until welded-on overlays are recognized as the one greatest adjunct to present-day oil field drilling economies. As a result of the experiences gained in its use as a process for maintenance alone, the process has been developed to the point where it is an integral part of the fabrication of new drilling tools.

Here and there, industries other than those connected with the acquisition of petroleum and its allied products have adopted "hard facing," as the overlay process is dubbed in the oil fields, and have found it equally capable of solving their problems, particularly those resulting from abrasive wear. There seems to have been very little concerted effort, however, to determine just what this relatively new process actually is and just how, if at all, it may be incorporated in various designs and for various wear-resisting purposes.

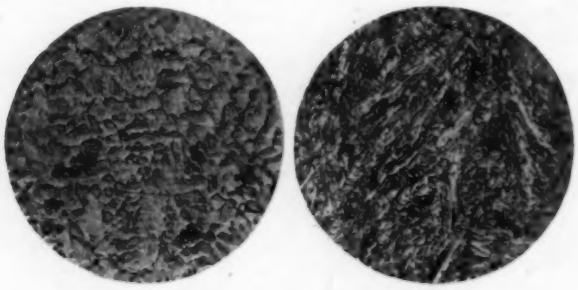


Method of building up a steam shovel tooth by welding on several layers of overlay. The under bead is at right angles to the upper

It will be remembered that it was only with the impetus given heat-treated alloy steels during war-time activities that designing engineers began taking advantage of alloy steels and heat-treatment with a consequent change in the primary principles of machine design. Today, it is hard for the machine designer to believe that less than twenty years ago the strength of material he acquires through alloying and heat-treatment could only be secured by an increase of cross-section. Tomorrow, the machine designer will feel the same way about the present-day practices of carburizing an entire machine part to secure surface hardness, when all that is required is surface hardness at one particular point or over a very small area. Machine designing practices are soon to undergo quite as radical a change as with the adoption of alloy steels and heat-treatment. With this in view, it is essential that both designing engineers and metallurgists in general familiarize themselves with the possibilities of welded-on overlays.

Welded-on overlays or hard facings consist in the covering of a desired metallic area by welding on a metal that will cool to a hard, abrasive-resistant deposit or overlay. The welding may be accomplished with either the electric arc or the oxy-acetylene torch, and the overlay metal may be in any one of many different forms. At the present time, the metals recommended for use as welded-on overlays are all proprietory products, varying in physical form and appearance, and each applied by

an individually recommended procedure. There is nothing mysterious about hard facing, however, either as a process or in its application. The process is purely and simply a metallurgical development. Welding, properly speaking, is a process for joining two metals, and in welded-on overlays, the electric arc or oxy-acetylene flame is used to melt down the overlay material and fuse it to the parent metal. The material melted down to form the overlaying deposit is, almost without exception, either a smelted mixture or an unfused mixture of several metallic elements and alloys which have been found to have a relatively high melting point and a relatively high



At the left—Photomicrograph (100 times) of a welded-on "Stoodite" overlay deposit containing no tungsten. It has a hardness of 58-59 on Rockwell C-scale. Dark spots are pits and not metallic substances. At the right—Photomicrograph (100 times) of welded-on overlay of "Stoody" self-hardening rod, also without tungsten. It is much harder than heat-treated steel

degree of hardness. Many such materials are built around or are largely composed of metallic tungsten and carbon which unite in the process to form tungsten carbide.

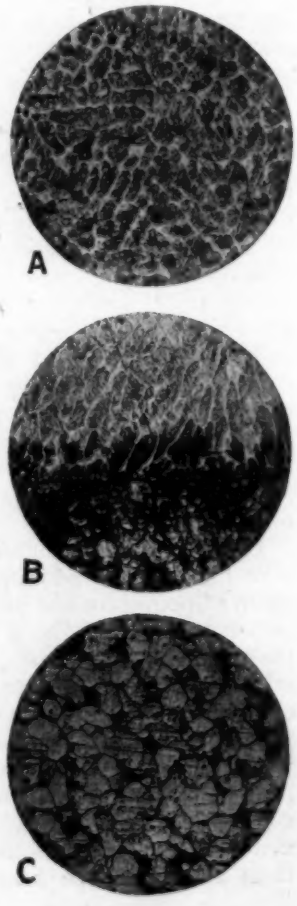
The inherent qualities of tungsten carbide are too well known to require much in the way of explanation. Tungsten carbide is well in the range of a diamond in hardness. Although it possesses little resistance to fracture, it is highly wear resistant, even when red hot. Tungsten carbide, especially if it be quite pure, does not offer much to the machine designer. Metallic tungsten when alloyed with other metals, however, lends much in the day of desirable characteristics to a welded-on deposit, and it is quite possible that an alloy of tungsten will be found best to meet the majority of overlay requirements. A recent development in the laboratories of the Stoody company is an overlay material consisting of unsmelted tungsten, carbon, and a suitable binder—all encased in a soft steel sheath. It smelts down under the heat of a welding arc or flame to a deposit that has the surface qualities of tungsten carbide, with the structural strength of alloy steel. The deposit from this overlay material or rod actually consists of quite pure tungsten carbide held in place and cemented or fused to the parent metal by an alloy mixture consisting of iron, iron-tungsten alloy, and iron-tungsten-carbon alloy. When such a deposit is fractured, the surface of the fracture gives the appearance of a fine grade of tool steel, but under the microscope, the surface of the deposit shows the unmistakable crystals of quite pure tungsten carbide.

Generally speaking, hard facing metallurgy is very much in its infancy, chiefly because of its narrowed range of application at the present time as well as because of its newness. Sufficient research has been done, however, to assure those engaged in the production of overlay materials that they are wholly prepared for new demands from a broadening of application. Overlays have been developed that have individual characteristics for specific applications, and the total of all of the developments offers a group of overlays to meet almost any and all conditions known to be existent at this time. Further use will no doubt call for added experiment with a consequent increase in diversity of overlays.

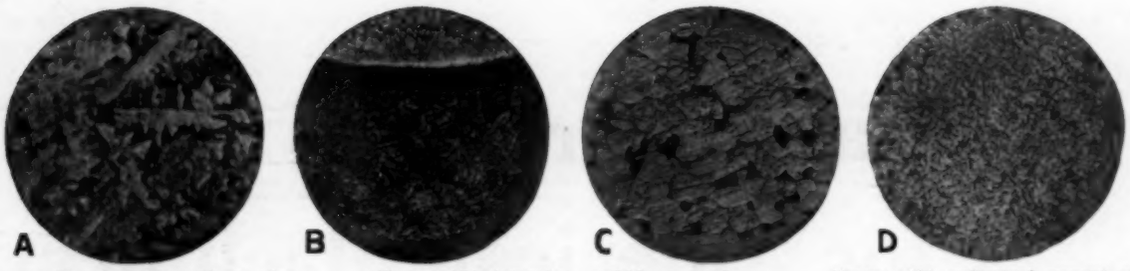
In so far as the machine designer is concerned, welded-on overlays or hard facings could be adopted to insure against wear caused by friction or any abrasive wear. Parts now treated to produce surface hardness could be overlayed and it is entirely possible that the use of overlays would make an opportunity for some changes in the basic design. In oil field drilling operations, hard facing has been found greatly to increase the useful life of oil field tools as well as increase the drilling efficiency of the tools; hence it could be expected that hard facing would attain similar results when applied to other classes of equipment. At the present time, there are scattered instances where welded-on overlays have made possible operations which, at first, were considered almost impossible to perform. Because of the hard, glass-like character of their surfaces, these overlays perform their characteristic functions, even when heated to red heat.

Rather than elaborate upon a list of possible applications and uses for welded-on overlays, it seems far more practical, at least at this time, to outline the characteristics of the various overlays and, from a knowledge of these characteristics, determine the applications. With this in view, tungsten carbide in its quite pure state should be considered first.

Quite pure tungsten carbide is too hard to be tested by any ordinary hardness testing equipment. It may be ground, but grinding it is a long tedious operation, and there is considerable danger of fracturing or checking the tungsten carbide in the process, for it has little structural strength. A surface overlayed with quite pure tungsten carbide will resist abrasion, perhaps better than any other metallic surface. Since the melting point of tungsten is well over 6,000 deg. F., a tungsten carbide overlay cannot be injured by any ordinary heats such as those caused by friction or the most commonly found heat agencies. Like every other extremely hard substance, though, tungsten carbide is extremely brittle and cannot be successfully utilized where it would be unsupported.



Photomicrographs (100 times) of the cross-section of a deposit of the welded-on overlay shown in Fig. 3: (A) deposit; (B) the point of fusion, showing complete intermingling with the parent metal; (C) parent metal, which is soft steel



Photomicrographs of cross-sections of a welded-on overlay deposit of "Borod" consisting of small crystals of tungsten carbide intermingled with iron, iron-tungsten alloy, and iron-tungsten-carbon alloy: (A) tungsten carbide crystals—magnification 500 times; (B) line of fusion with soft-steel parent metal, showing complete fusion and penetration of overlay metal—magnification 100 times; (C) soft-steel parent metal, unaffected in the welding process—magnification 100 times; (D) for comparison, case-hardened steel, quenched in water—magnification 100 times

Tungsten, however, lends many desirable characteristics to an overlay when it is alloyed or intermingled with other metallic elements such as chromium, manganese, iron, and cobalt. For this reason, many metallurgists have used tungsten as a basis for the compounding of overlays and have hoped to supply the desired qualities that are lacking in pure tungsten by the addition of metallic elements possessing those qualities. These various alloys of tungsten have met with considerable success, and it quite safe to say that such alloys will continue in favor for many applications.

There is still another class of successful welded-on overlays in which no tungsten is present. These overlays depend upon chromium, manganese, iron, silicon, and some of the rarer metallic elements for their properties, and as an illustration of the mysteries of metallurgy, they exhibit an almost identical structural appearance and have almost the identical performance properties of the tungsten alloys.

Regardless of the elementary content of welded-on overlays or hard facings, it is essential that there be a clear conception of the metallurgy involved in the application of such overlays before one may determine their use or worth.

In the process of welding on an overlay or hard facing, the alloys or materials used to produce the overlay are actually smelted in the open air at a temperature about 6,000 deg. F. If properly applied, the overlay will be completely fused to the surface of the parent metal. The facing may be applied to any metallic surface which may be welded, but it is essential that some consideration be given and some procedure be determined to compensate for the differences in expansion of the parent metal and the overlay material. Although the usual type of overlay has a relatively small coefficient of expansion in comparison to steel, there is little likelihood of any damage in contraction, if the parent metal be in a state of expansion when the overlay is fused on, so that the parent metal and the overlay cool simultaneously. Otherwise, particularly if the overlaying be done with the electric arc, the fusing of a hot layer of metal on a cold surface would result in setting up structural strains in both the parent metal and the overlay which might cause damage.

Once in place, welded-on overlays may be ground as desired. The harder the overlay, the more difficult will be the grinding operation, though any overlay may be ground to a glass-like surface and shaped as desired.

So far, equipment which is exposed to such abrasion as is quite kindred to the service of oil field tools has been most successfully hard faced, and the results have been pronounced most satisfactory. There have been many possible uses, however, which have never been attempted. If other types of equipment are found to be only partially as well adapted to overlays as oil field drilling equipment, the effort expended in research will be paid for many times. Besides being wear resistant, the metallic alloys used in overlays are, for the most part, corrosion resistant, and have a low coefficient of friction. These properties suggest many possible applications in general machine design.

It is only natural that overlaying should meet with considerable opposition, since every movement which entails a radical or even a partial change in design procedure does. In the instance of hard facing, though, it would seem that fabricators of machinery have been unduly skeptical. No doubt a great part of this skepticism has resulted from not being acquainted with either the process or its possibilities. Welded-on overlays are by no means a haphazard process which has accidentally come into existence; on the contrary, they are the direct product of intensive research procedure carried on along a single specific line and with a single purpose. The future of the process is assured. It only remains for designers to apply it to their particular problems.

A Reliable Source of Engineering Information

FEW production men and engineers realize the tremendous facilities of the Engineering Societies Library, maintained by the major engineering societies of the country at 29 West 39th St., New York. The library contains 125,000 volumes and 6,000 maps, as well as 1,700 periodical publications. All of this information is for the service of the members of the various societies, and is available to them at their request. The library makes all sorts of investigations, among them the determination of the originality of inventions, and the validity of patents; it will furnish lists of literature on a process or a theory, as well as answer the many minor requests for information which are received.

Periodicals are received from all over the world, half of those received being printed in the United States and the remainder in 36 other countries. This information is classified and filed so that it may be found readily. The Engineering Index Service, through the Engineering Societies Library, makes available the contents of the various engineering publications by a comprehensive index, published week by week on 3x5 cards. Photostat copies of any article indexed may be obtained quickly and easily through this service.

Japan as a Market for American Machinery

Japan's desire to establish home industries to supply her needs is apparent, but she will continue to import such machines as can best be supplied from outside sources. We will continue to sell her just in proportion as we can supply her needs better than anyone else. First-hand knowledge, however, is necessary for any sincere marketing effort

By FRED H. COLVIN
Editor, American Machinist

IT IS NOT easy to picture the machinery and machine tool situation in Japan because, as with us, there are so many seeming contradictions. Just as in America, those of us who are accustomed to visiting the automobile shops are likely to get the idea that their type of high-production equipment is typical of our shops, so in Japan we may get similar impressions that are not borne out by a careful study of the general situation.

Although the first machine tools sent to Japan were French, the British influence is noticeable in many things mechanical. Locomotives and freight cars all follow British design, and it is not surprising, therefore to find that machine tools in the railway shops are largely of British origin. Many of them, as is too often the case in our own shops, are of ancient vintage and should have been pensioned long ago. On the other hand, it is not safe to judge of the wisdom, or otherwise, of continuing to use old machines without considering both the cost of labor and the quantity required. For if the old machine can do work of satisfactory quality and the output is small, the low wage rate may not warrant investing in a new high-priced machine. These considerations also affect the purchase of our newer types of machines in which rapid traverse and power movements of all kinds play such an important part. In the United States, where high wages and larger production make these features desirable from every point of view, the increased cost of these improvements is justified, but in Japan the increased cost may not be entirely justified under certain circumstances.

In Japan, on the other hand, according to some dealers and users with whom I have discussed the situation, these improvements are neither necessary nor particularly desirable at present. And, as they increase the cost of the machine, they are more of a hindrance than a help in selling. To some dealers who object to the newer machines and want the older and cheaper machines, I have pointed out that, having equipped their plants to build the new machines, our machine builders might find that it would cost more to continue the older, simpler line, which would then be a special machine instead of a part of the regular output. For, unless there is enough demand for a certain line of machine to take it out of the "special" class, the advisability of building it in a shop with other machines is doubtful.

From the point of view of a dealer in such a market as Japan, these refinements in design and construction that are so desirable in our own market, make it more difficult to meet the competition of machines built in other countries where the machines of plainer and simpler design are still in use. Apparently the bulk of machines from other countries are coming from Continental Europe rather than from Great Britain, which does not seem to be maintaining the lead indicated by the number of older machines seen in various shops. Germany, if one can judge from the shops I have visited, is leading in the machines coming into Japan, especially in those of larger sizes, such as are found in the shipyards and plants building engines, either steam or Diesel. A crankpin turning machine is a good example of this, the same type of machine having also found its way into some of our own shops.

Then too, those who desire to sell machines of any kind to Japan, and who wonder why they do not receive orders from their agents more frequently, must not forget that many machines of different kinds are now being built at home. Having taken a leaf from our own economic theory of fostering infant industries, the Japanese government is doing the job with the same thoroughness that characterizes its other activities. As the policy has been explained to me, the government allows a differential of 10 to 15 per cent on domestic machines built in competition with those of foreign makes, if of equal quality. This differential, or premium, is supposed to be reduced, however, according to the volume of business done by the concern. As the business grows, the theory is that it needs less assistance, and the premium is lowered until it finally disappears and the builder is in direct competition with the rest of the world. This applies, of course, only to machines built for the various branches of the government or for businesses that may have been fostered by subsidy or tariffs of some sort, all of which is in accord with our own theories. Whether the premiums are actually reduced or not is probably as problematical as in our own practice. In any case, we can hardly object to the theory of its

practice, so long as ours are no different from theirs.

As a result of this policy, Japan now builds a large proportion of its supply of lathes, drilling machines, shapers, slotters, and planers of ordinary sizes. It is also building milling machines of standard types to some extent and other machines in small numbers. Automatics, semi-automatics, and more or less special machines, such as gear-cutting machines and the newer types of grinders, are still imported for the most part, whether for governmental or private use. This bears out the statement that on machines that cannot be equalled as yet in Japan it is the policy to import them from what are considered the best sources of supply, even at a higher price. Machines of this type offer the best opportunity for American builders at present, although for some classes of work both British and European machines are very active competitors.

A Japanese Shop in the American Fashion

I visited a gear-cutting shop in Osaka that has been built up by an excellent Japanese mechanic in what we like to think of as a truly American fashion. He started about 20 years ago with two old lathes and a milling machine that served as a gear cutter. Year by year his business grew until at present he has a large equipment of machines that includes almost every make of American gear-cutting machine, together with a goodly supply of gear cutters of many types from Europe. He cuts anything from small spurs to large helical gears and can hob a 156-in. gear by taking out a few windows. He showed me a splendid example of a small spiral bevel gear cut from fiber that was to run at 20,000 r.p.m. I mention this as an example of the variety of machines found in the shops here and to show that there is still a market for machines of this type. It is to be expected, however, that Japanese shops will endeavor to enter these fields as rapidly as conditions permit.

It may be of interest to note that I have not heard the subject of metric measurements mentioned in any shop as yet, even though Japan is classed as a metric country. Without doubt, metric measurements are used in some instances, but I have been assured by a man who should know conditions fairly well, that the question of inch or metric measurement has no bearing in the selection of machines. In many statistics the old native units are still used. On the other hand, the time table of the Imperial Government Railways gives the distances in miles instead of kilometers. In view of these facts, there seems to be little to bear out the contention of our prometric friends that we are losing much business because of our stubborn adherence to the English inch.

In other lines, such as textile machinery, printing presses and the like, a strong effort is being made to manufacture enough for Japan's own needs and for export, if possible. American and other machinery is still being imported, but much is also being made here. In certain instances, American and other patented articles are being manufactured under license, including such items as Westinghouse air brakes, Pioneer aircraft instruments, Diesel engines, steam boilers, and many other devices. For even though the quantity manufactured is too small to insure maximum economy in production, the advantages of being able to supply her own needs is more important to Japan. On articles manufactured elsewhere and assembled here, the tendency is to have as many of the parts as possible manufactured in the country as fast as suitable sources of supply can be found to encourage home industries.

Low Wages Militate Against Modern Equipment

Generally speaking, the average shop I have visited has much equipment that is older than we think advisable, although many of our own shops are in the same condition. As stated before, however, the low wages that prevail compel the use of a different factor in figuring the economic return and in determining when it pays to scrap a machine. An increase in wage rates or in demand for product, both of which seem likely as time goes on, will compel the discarding of much present equipment and the purchase of new machinery.

During the next ten years, much new machinery will be installed in Japanese shops, and many of these machines will be imported to meet the needs for lower machining costs. Judging from past experience here and elsewhere, sales of this kind will be made through local agents who are well and favorably known to the Japanese manufacturers, and who know the customs and buying habits of the country. High-pressure salesmanship and whirlwind campaigns are likely to result in useless expenditure and in disappointment.

謹んで愛讀諸士の御多幸を祈る

アメリカン・メカニスト

The fact that there are several well-known machinery agencies in Japan selling enough machines, equipment and supplies to make it a profitable business indicates that new machinery is being bought constantly. It seems logical that concerns so well established will be in better position to handle new business as it develops than any newcomer can possibly be. But seeming miracles do happen occasionally and predictions are always dangerous.

We who live seven to eight thousand miles away under entirely different conditions are likely to become impatient and to expect results that are impossible of accomplishment. First-hand knowledge is necessary to understand the situation thoroughly, and it is strongly advised that some of those who are responsible for results at home come to Japan and study the conditions for themselves. Japan is progressing far more rapidly than might be expected. Her desire to establish home industries to supply her needs is both understandable and commendable, as in so doing she is following the example of her Western neighbors. She will continue to import such machines as can best be supplied from outside sources, and we will continue to sell to her just in proportion as we can supply her needs better than anyone else. The only way to judge whether one is getting his share of the business is to come to Japan, to visit the shops, and to draw one's own conclusions. Then, and then only, can a true and accurate picture of conditions governing Japanese buying of American Machinery be attained.

IDEAS FROM PRACTICAL MEN

The department, "IDEAS FROM PRACTICAL MEN," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit.

A Three-Dimension Fixture for Cutting Cams

BY C. W. HINMAN
Kobzy Tool Company

THE CAM shown in Fig. 1 is rather unusual because of the direction of part of its raceway in relation to the motion it controls, due to the fact that the cam roller is mounted on an arm that swings in a circular path. Usually, cams of the design shown are intended for imparting motion in a straight line and not in a circular path. In the cams made before the fixture about to be described was put in use, it was found that the roller bound in several places in the raceway, so that it was necessary to redesign the cam.

In the redesigned cam, the point *X* represents the center of the fulcrum screw upon which the roller arm pivots. Since the center of the fulcrum screw is 3 in. from the center line of the cam, and opposite to the mid-point of the cam throw, it will be seen that the center of the roller, swinging in an arc having a radius of 3.125 in., will be on one side of the center line of the cam when in the midway position, and on the opposite side of the center line at each end of the throw.

Tooling up for cutting the cam involved the designing of a fixture that would revolve the cam on its axis, and at the same time move it both in the direction of its center line and at a right angle thereto, the latter motion to take place while the cam was being revolved through an arc of 168½ deg. The right-angle motion must carry the center line of the cam past the cutter in both directions for a predetermined distance, in order to compensate for the circular path of the cam roller. After the cam has revolved through the arc mentioned, the movement at a right angle to its center line must cease, and while it is revolving through the other part of the circle, its only horizontal motion must be in the direction of its center line.

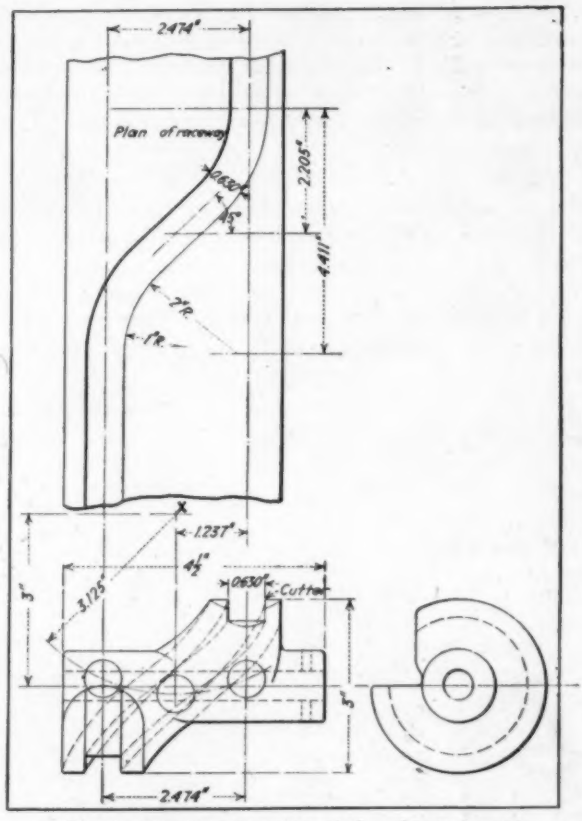


Fig. 1—Working drawing of the cam to be cut

The fixture, shown in Fig. 2 with the cam blank in place, was mounted on a milling machine of the knee

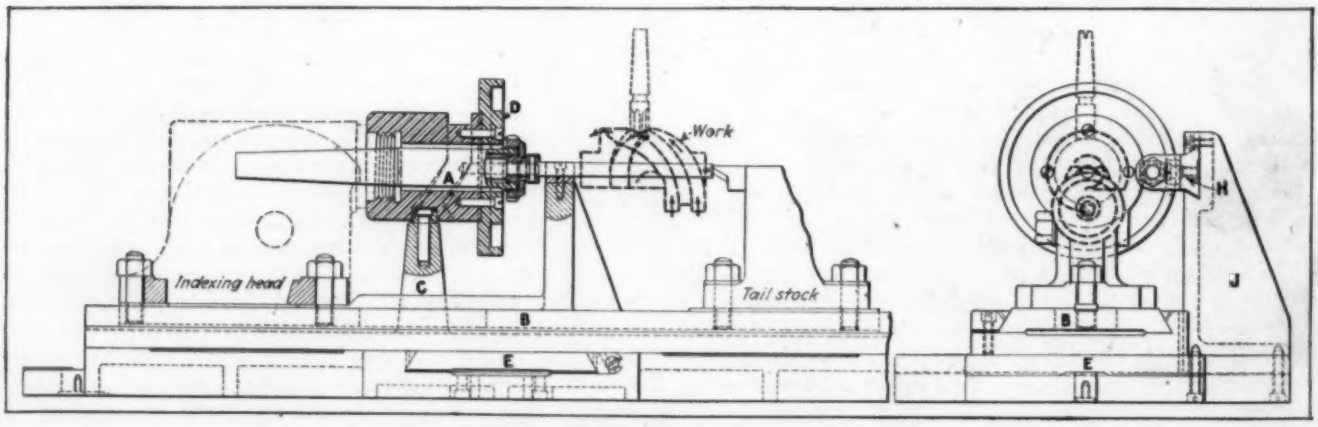


Fig. 2—The fixture for cutting the cam

type equipped with a dividing head. The cams for controlling horizontal motion in two directions are mounted on the spindle of the dividing head and are revolved by turning a crank attached to the shaft carrying the indexing worm.

The cam *A* is a barrel cam and imparts motion to the slide *B*, through a roller mounted on the upright *C*. The cam *D* is a face cam and is attached to the end of the cam *A* by screws. It imparts motion to the slide *E* in a direction at a right angle to that imparted by cam *A*, through a roller mounted on the dovetailed slide *H* on the upright *J*. The dovetailed slide *H* is necessary because the cam *D* and its roller must move crosswise of the upright *J* a distance of 2.474 in. while the cam being cut is moving in the direction of its center line. Both cams are so located in relation to each other that their dwells and their cutting movements will occur at the proper times.

Of the several thousand cams cut annually in this fixture, each one has functioned smoothly and without having the roller bind at any point.

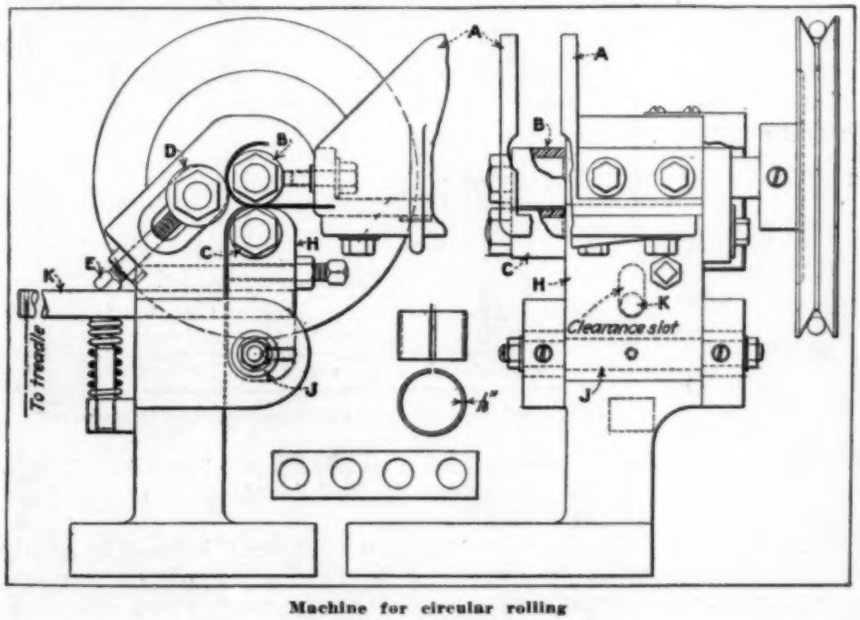
Machine for Rolling Circles from Strips

By B. J. Stern

The machine shown in the illustration is for rolling flat strips into circles. The work, shown in the center of the illustration, is first pierced and blanked from strip stock and is then rolled into the required circular shape without deforming the punched openings.

The blanks are fed by hand between the adjustable guides *A*, being then forced between the hardened and ground rollers *B* and *C*, which are being revolved in opposite directions by the pulley and gears shown at the right. The blank strikes the forming roller *D* and is then forced around the upper roller *B*. After being allowed to rotate for several seconds to give it a set, the work is then slipped off of the upper roller by the operator, the front end of the roller being unobstructed. The upper roller *B* runs in a permanent bearing in the main casting of the machine, while the forming roller *D* is adjustable for forming work of different diameters by means of the screw *E*. In order to make the space between the rollers *B* and *C* adjustable for different thicknesses of stock, the roller *C* is carried in the swinging arm *H*, which is pivoted on the pin *J* in the main casting. However, there is not enough swing to the arm to cause disengagement of the driving gears.

Pressure exerted by a spring against the pin *K* keeps the roller *C* away from the work until it strikes the forming roller *D*, at which time the operator depresses a treadle (not shown) and forces the work against the upper roller *B*, causing it to be seized and fed between both rollers and to be forced around the upper roller by the forming roller. The base of the main casting is provided with bolt slots so that it can be bolted to the bench.

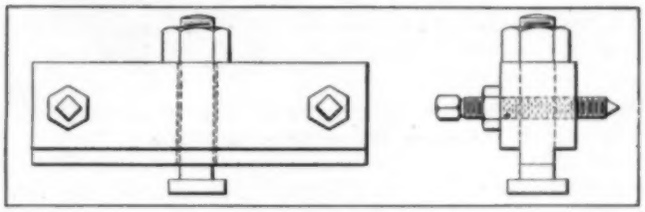


Machine for circular rolling

A Handy Stop for Planer Work

By H. L. Wheeler

The planer stop shown in the illustration is a convenient addition to the equipment of a planer. It is made of machine steel, and can be casehardened if desired. A tongue on the under side fits into the upper part of the T-slots of the planer table, and the stop is held securely by means of a single bolt. Two stop screws are provided and can be used either to hold the work directly, or through the medium of "hold downs."



A handy planer stop

A stop of this kind is preferable to the kind that fits into the round holes to be found in most planer tables, as such a stop is easily bent, and when bent is difficult to remove.

Reproducing Drawings to a Different Scale

By G. W. McArd
Whiteley Bay, England

It sometimes happens that drawings have to be reproduced to a larger or smaller scale than originally drawn. A typical instance of such reproduction occurred recently in the drafting room in which I am employed. An assembly drawing of a large tank-locomotive, drawn to one-twelfth scale, was required to be furnished to a scale of one-twentieth to enable certain government formalities to be complied with.

To avoid the expense of redrawing to a smaller scale, the drawing was photographed on a 10x12-in. negative

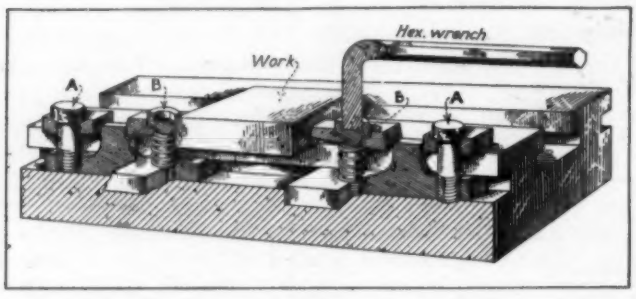
from which an enlargement to the scale required was made on bromide paper. The enlargement was traced by a girl, at a cost, including the photographer's charges, of less than a fifth of the outlay that would have been entailed had a draftsman been given the job of reproducing the drawing in the usual manner.

If it had been possible to obtain the government engineer's sanction, the enlargement could have been made to the required scale on sensitized tracing cloth, making the cost even less.

Clamping Fixtures to Fit T-Slots

By Theodore Kruger
Toolroom Foreman, Diamond Machine Company

In the illustration is shown a pair of clamping fixtures to fit in the T-slots of machine tools. The bases of the fixtures are fitted to the T-slots and are clamped in place by the screws *A*, which are threaded into tapped holes. Square washers are placed under the screw heads to prevent them from marring the table surface. The washers cannot turn, as their square edges are against



Clamping fixtures fitted to T-slots

the abutments for the clamps. The clamps are held down by the safety screws *B*, which are likewise threaded into the bases of the fixtures.

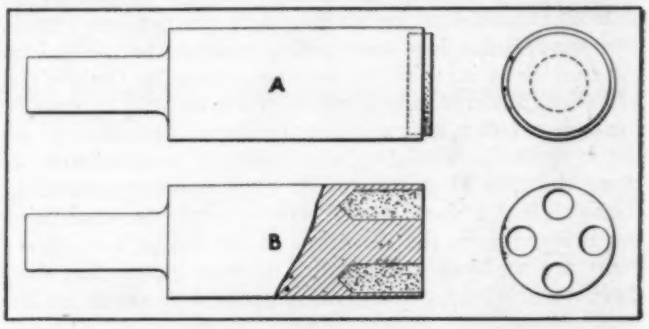
In loading and unloading, the fixtures are not moved from their positions, as all that is necessary is to tighten or loosen the screws *B*. Springs under the clamps raise them sufficiently to admit or remove the work when the screws are loosened. For holding very thin work, especially on a surface grinder, the heads of screws *B* should be flat and countersunk into the clamps.

Tools for Decorating Flat Surfaces

By Raymond H. Dauterich
Crescent Engineering Company

Having a quantity of small cast-iron plates with smooth-finished surfaces, which we desired to decorate without using the expensive hand-scraping method, we decided to spot them under a drill-press spindle, through the medium of the customary round stick charged with abrasive paste. This tool produced a frosted appearance and would have proved satisfactory, but after a trial we soon found that the method was too slow, as it was impossible to keep the abrasive paste between the surface of the plate and the end of the stick. So we experimented a little.

First, we tried a small, smooth abrasive wheel inserted in a steel rod, as shown at *A*. This device was effective but not satisfactory, because it scratched the surface of the plate and left it rough. Then we tried the device shown at *B*, which completely filled the requirements. It consists of a piece of 1-in. round fiber rod, turned on one end to fit a drill chuck. In the other end we drilled a series of small holes about $\frac{3}{4}$ in. deep. The holes were



Tools for damaskeening

filled with grinding paste, which was slowly fed to the end of the fiber rod by gravity, always keeping some of the abrasive between the rod end and the surface to be decorated. The result was quite satisfactory, both for rapid progress and for the character of the work.

Formula for Measuring Dovetails

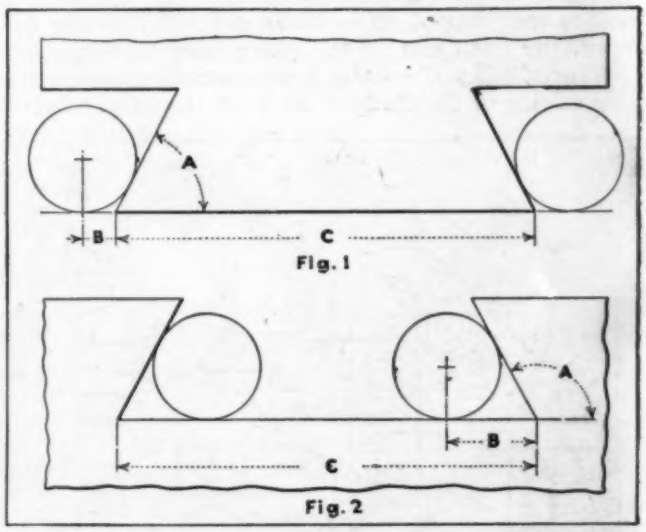
By Clarke B. Heath

In measuring dovetails of known angles by the so-called plug method, the distance *B* can be found by the following formula:

$$B = \tan\frac{A}{2} \times \frac{\text{diameter of plug}}{2}$$

In Fig. 1, where the angle is 60 deg. and the diameter of the plugs is 1 in., $B = 0.57735 \times 0.5 = 0.288675$ inch.

In Fig. 2, where the angle is 120 deg. and the diameter of the plugs is 1 in., $B = 1.73205 \times 0.5 = 0.866025$ inch.



Figs. 1 and 2—Inside and outside dovetails to be measured

This formula can be used for dovetails of any angle less than 180 degrees.

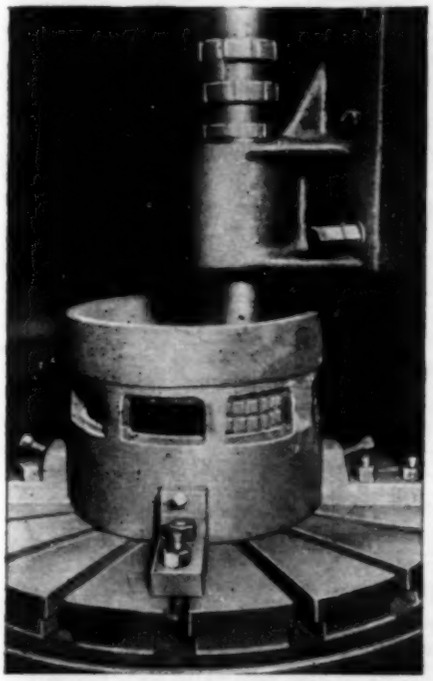
In the case of Fig. 1, the distance *C* is found by adding twice the distance *B* to the diameter of one plug and subtracting the result from the measurement over both.

In the case of Fig. 2, the distance *C* is found by adding twice the distance *B* to the diameter of one plug and then adding the result to the measurement between the nearest points of both plugs.

Milling Ports in a Valve Bushing

By Max Schwarze
Foreman, Milwaukee Shop, C. M. St. P. & P. Railroad

The usual method of milling the ports in a valve bushing by means of an end mill is tedious and expensive. A more economical way of doing the work is shown in the illustration. In this case a vertical milling machine is used, the casting being mounted on the circular table, which is used for indexing only. The cut is taken with the usual longitudinal feed.



Milling ports in a valve bushing on upright milling machines

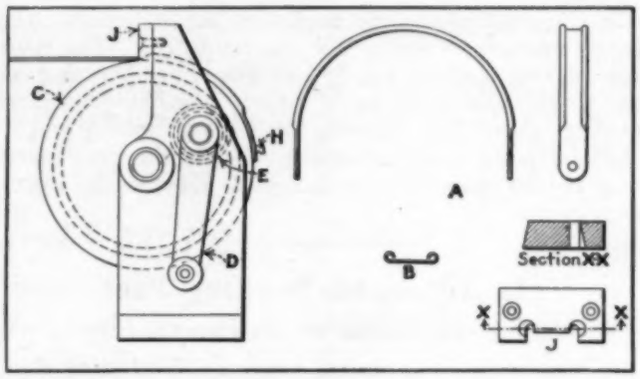
The cutters are adjustable thus making it possible to cut any desired width. This adjustment is accomplished by inserting a spacer between the cutters of such dimension as is required. Both sides of the port are cut at the same time so that their sizes are all the same and are of accurate dimension. A single cut can be used on most bushings, especially those that are cored so that only half of the thickness of the bushing need be milled. On bushings that have not this feature a second cut from the outside is necessary since the diameter of the cutters will not permit them to cut entirely through.

A Combined Bending and Curling Tool

By James R. Cornelius
Coventry, England

A tool for bending bails, such as the one shown at *A*, into semicircular shape, and at the same time curling the edges, as at *B*, is shown in the illustration. The bails are blanked from 0.032-in. brass, and have straight, flat extensions at the ends. In the blanking operation, holes are pierced in the bails for attaching them to the containers by rivets.

The tool consists of a base having an upright, a bending roll, a pinion, a crank, and a curling die, all of which are mounted on the upright. The bending roll *C* has an internal gear and is operated by the crank *D* through the pinion *E*. In the periphery of the bending roll is driven the hardened pin *H*, and the curling die *J* is attached to the top of the upright.



A bending and curling tool

With the pin *H* in front of the curling die, a blank is hooked to it by one of its holes. Rotating the crank revolves the bending roll, carrying the blank with it and through the curling die, thus bending the blank and curling its edges at the same time.

Cutting Steam Ports in Cylinder Bushings

By M. H. Westbrook
Supt., Battle Creek Shops, G. T. Railway

Our regular practice in cutting the steam ports in bushings for locomotive cylinders is to mount them on the revolving table of a milling machine, and to cut the ports by drilling and milling, revolving the bushings while the milling is being done. However, it was necessary to cut the ports in some bushings at a time wher the milling machine was tied up by other and more important work, so we did the job in a horizontal boring machine, as shown in the illustration.

A 2-in. four-fluted cutter was ground on the end to form a two-lipped drill for drilling the starting holes. When the starting hole for one port had been drilled, the table of the machine was traversed the full length of the port, the cutter then being in action. It was not found necessary to revolve the bushing while the port

Milling ports in cylinder bushings on a horizontal boring machine

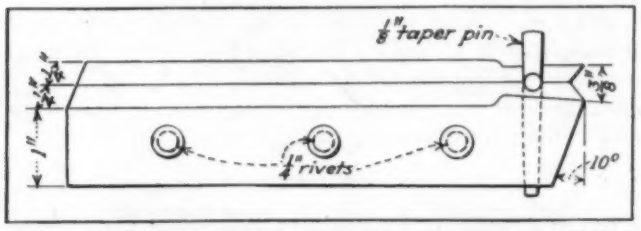
was being milled, as the angles at the ends were left nearly enough correct by the traversing cut. The time for the first bushing was 55 min., floor to floor, and on the second bushing it was 48 min. The work included drilling eight 2-in. starting holes and milling eight 2x7½-in. ports in each bushing. While the time given may not be out of the ordinary, I thought it worth mentioning.

An Adjustable Necking Tool

By George W. Hammitt

Where necks, or grooves, are to be finished to close dimensions in width, the tool shown in the illustration is very convenient.

The tool is made in halves riveted together as shown.



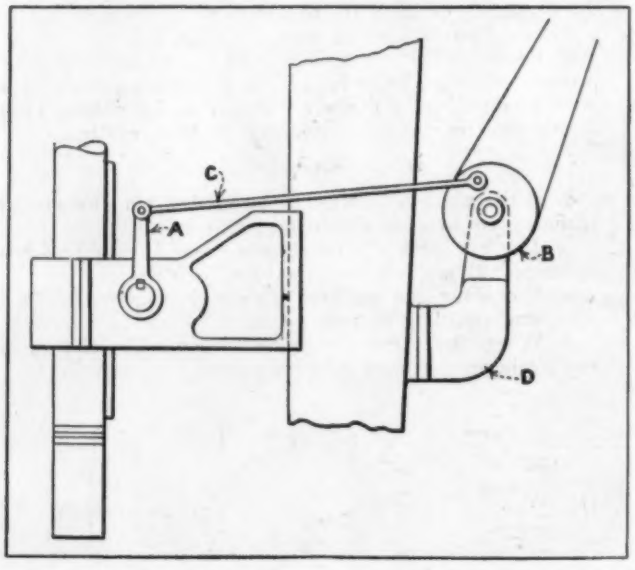
An adjustable tool for necking or grooving

A taper pin fitting in a hole near the point provides means for expanding the cutting edges. The point, ground in the shape of a fish tail, will make a clean cut, taking a light chip. The cutting edges can be expanded to fit a snap gage or the opening of a micrometer. The tool is intended for finishing only.

Automatic Spindle-Feed for Countersinking

By Ernest Foldvary

An automatic feed and return for a drill-press spindle is shown in the illustration. The work to be done is the countersinking of holes in small parts, where the quantities are large. The arm *A* is keyed on the end of the pinion shaft, and is connected to a crankpin on the pulley *B* by the rod *C*. The bracket *D* is attached to the rear of the machine column and carries the pulley, which is driven by a belt from an overhead shaft.



Automatic feed and return for a drill press

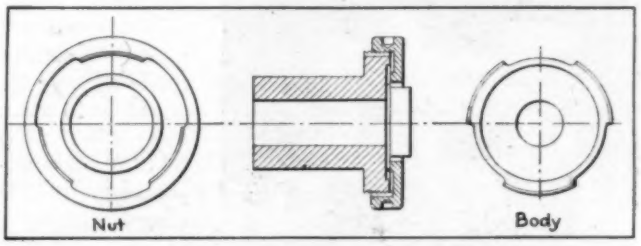
The parts to be countersunk are placed in position by hand by sliding them under the countersink. As the vertical motion of the spindle is a reciprocating one, it is necessary only to feed the work in time with these motions. A very high production can be attained by the use of this attachment, and the cost of making it is relatively small.

Half Turn Screws for Holding Work *Discussion*

By V. Van Zeebroeck
Antwerp, Belgium

In connection with the article under the above title by G. E. Newbery on page 513, Vol. 69 of the *American Machinist*, I wish to suggest the following improvement, which I have found advantageous.

Having a lot of disks to grind, I made up a holder



Interrupted thread fixture for holding work

as described and illustrated by Mr. Newbery. I soon found that the time for loading and unloading was still too long in comparison with the actual grinding time. I changed the fixture by milling off some sections of the thread on both the body and nut, as shown in the illustration, thus reducing the loading time still further.

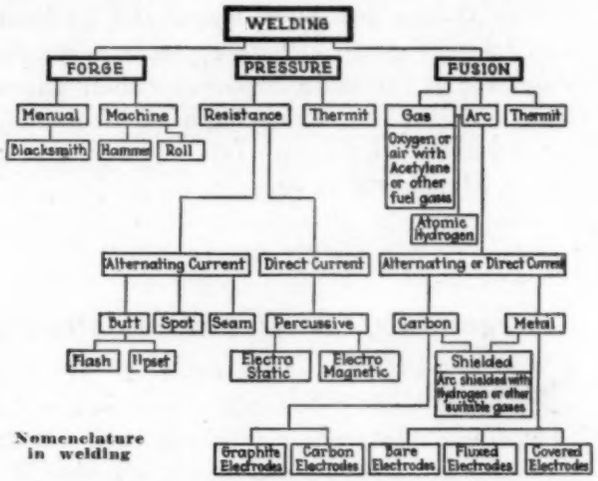
Dimensions of Recessed Pockets for Nuts—*Discussion*

By W. R. Needham
Design Engineer, English Electric Company, Ltd., Stafford, England

The illustration and the table of dimensions with the article by A. Mitchel on page 905, Vol. 70, of the *American Machinist*, is an example of useful data, and draftsmen especially should profit by it. It is surprising that what should be a perfectly obvious consideration is overlooked time and again. Bolts are often placed in spots where it is difficult or impossible to work a wrench. There are few things more annoying to the shop man, than to have to chip away large masses of metal where a little foresight on the part of the draftsman would have obviated any such necessity. I know of one firm where a complete set of spanner templates made of thin plywood is kept for drawing office use. It is often necessary for the draftsman to know not only that there is sufficient head room, but also that there is adequate clearance for at least a 30 deg. movement of the spanner shank, plus, of course, the width of the shank section.

Welding and Cutting

Nomenclature and Definitions



Forge-Welding Processes

1. BLACKSMITH WELDING: A forge-welding process which utilizes manual hammering.

2. HAMMER WELDING: A forge-welding process which utilizes mechanical hammering.

3. ROLL WELDING: A forge-welding process which utilizes mechanically operated pressure rolls.

Pressure-Welding Processes

1. RESISTANCE WELDING: A pressure-welding process wherein the welding heat is obtained by passing an electric current across a resistance set up between contact areas.

2. PRESSURE THERMIT WELDING: A pressure-welding process wherein the welding heat is obtained from the liquid products of a thermit reaction.

3. RESISTANCE BUTT WELDING: A resistance-welding process wherein a butt joint is employed. Fig. 1.

4. SEAM WELDING: A resistance-welding process wherein the weld is made linearly between two contact rollers, or between a contact roller and a bar. Fig. 2.

5. SPOT WELDING: A resistance-welding process wherein the weld is made in one or more spots by the localization of the current between contact points. Fig. 3.

6. PERCUSSIVE WELDING: A resistance-welding process wherein the electric current is suddenly discharged across the contact areas to be welded and a hammer blow is applied simultaneously or immediately after the discharge.

7. FLASH BUTT WELDING: A resistance butt-welding process wherein the weld is made quickly by a light contact pressure followed by a period of arcing with no pressure applied and finished with heavy pressure, some of the liquidfied metal being thrown out in a flash. Fig. 4.

8. UPSET BUTT WELDING: A resistance butt-welding process wherein the weld is made by a continuous contact pressure with only enough heat to bring the pieces to a plastic state. The weld is completed with considerable pressure, producing an upset at the joint. Fig. 5.

9. ELECTRO-STATIC PERCUSSIVE WELDING: A percussive welding process. A condenser supplies arc energy.

10. ELECTRO-MAGNETIC PERCUSSIVE WELDING: A percussive welding process wherein the stored energy in a magnetic field is transformed by the collapse of the field.

Fusion-Welding Processes

1. GAS WELDING: A fusion-welding process wherein the welding heat is obtained from a gas flame, oxygen and acetylene being the gases used unless otherwise stated.

2. ARC WELDING: A fusion-welding process wherein the welding heat is obtained from an electric arc formed either between the base metal and an electrode, or between two electrodes with or without the use of gases.

3. METAL ARC WELDING: An arc-welding process wherein the electrode used is a metal rod or wire, which, when melted by the arc, supplies the weld filler metal.

4. SHIELDED METAL ARC WELDING: A metal arc-welding process wherein the arc is surrounded by, and the molten weld metal bathed in, hydrogen or other gases.

5. CARBON ARC WELDING: An arc-welding process wherein a carbon electrode is used and a filler metal, if required, is supplied by a welding rod, as in gas welding.

6. SHIELDED CARBON ARC WELDING: A carbon arc-welding process wherein the arc is surrounded by, and the molten metal bathed in, hydrogen or other gases.

7. ATOMIC HYDROGEN WELDING: A fusion-welding process wherein the heat of an electric arc between two suitable electrodes is used to dissociate molecular hydrogen into its atomic form, which, on recombining in the molecular form, gives up the energy required to dissociate it, producing a flame of very high temperature, at the same time bathing the molten weld metal in hydrogen, a combination of the gas- and arc-welding processes.

8. FUSION THERMIT WELDING: A fusion-welding process wherein the welding heat is obtained from liquid steel produced by a thermit reaction, and the filler metal is supplied by the steel produced in this reaction.

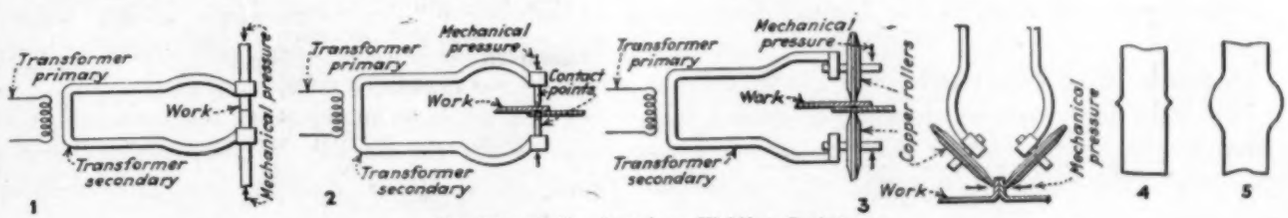
General

1. If the welding process to be used is not obvious, the name of the process should be given in full.

2. The use of the terms "spot" and "seam" shall be restricted to the resistance welding process.

3. When the gas welding process is referred to, "oxy-acetylene" welding is understood.

4. When the thermit welding process is referred to, fusion thermit welding is understood.



Courtesy of the American Welding Society

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Promoting Economic Balance

A PROPOSAL has been made to divide the country into nine economic areas, each to be represented by a council organized along the same lines as the New England Council. Details of the proposal appeared first in *The Business Week* and are being abstracted in this week's issue of *American Machinist*.

In the past, it has been found almost impossible to bridge the gap between national bodies, like the Chamber of Commerce of the United States, and local bodies, like city chambers of commerce. The success of the New England Council in tempering local rivalries and diverting at least a portion of the enthusiasm of local groups to the building up of the region as a whole shows that much can be done by a regional organization.

Now that industry is making a definite, co-ordinated effort to free itself from the toils of the business cycle, any proposal that suggests effective machinery to make the effort is worthy of consideration. That the regional economic council plan is eminently practical may be verified by a perusal of the annual report of the New England Council, entitled "A United New England: Four Years of Progress." This is obtainable at the N. E. C. Executive Offices, Statler Building, Boston.

*

Wages Not Chief Factor in Machine Economy

PURCHASING agents of the old type are of about the same mental caliber no matter where you find them. The old saying of the production man that they "know the difference between ninety cents and a dollar, and nothing else" seems to be still true whether they function in Manchuria or in the supposedly progressive United States of America.

A case in point is the purchase of a large driving wheel lathe for a new shop on a well-known railroad in the Orient. Price was the determining factor and the result is an output of one pair of driving wheels a day. A modern lathe would give four pairs a day in the same shop and under the same conditions. As a consequence, locomotives are delayed in going through the shop, their earning power is lost over a much longer period than is necessary, and the low priced machine is a losing investment from every point of view.

Under the conditions in question even the extremely low wage rate affects the situation but little, if any. Interest on the investment, the proper charge for floor space, and particularly the delay in getting motive power through the shop, are of far more importance than wages, or labor cost, the first item being of particular significance because of the high rate of interest prevailing in Manchuria at present.

*

Suggestions, Complaints, and Progress

SUGGESTIONS and complaints are closely related. Most builders of machines welcome suggestions that might improve their products. They realize that the use of any machine in production may develop minor weaknesses that are not apparent in the design and do not become apparent during factory tests of the machine. Where such suggestions give promise of improving the machine for the average user, builders are usually glad to make use of them.

When, however, the same ideas come as complaints, especially when couched in sarcastic or vehement language, any builder is very likely to build up walls of reserve or antagonism that prevent him from giving the new ideas the consideration they deserve. By so doing, he allows his resentment to prevent, or at least to delay, the adoption of the new ideas.

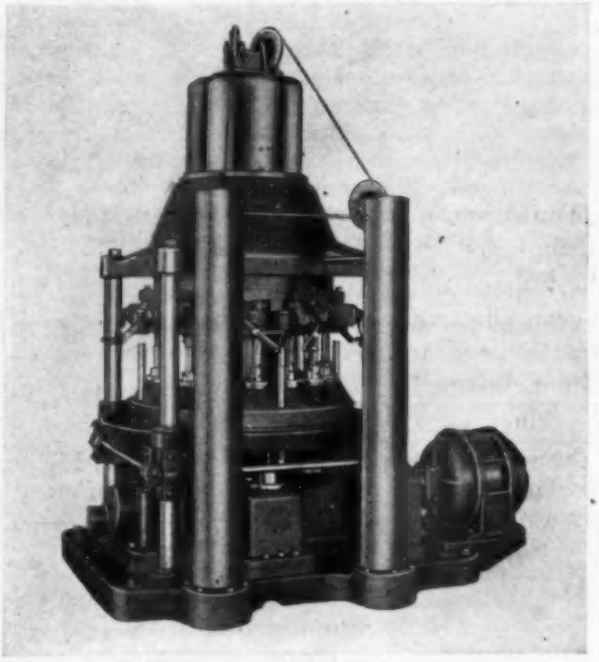
Users of machines also have their peculiarities regarding suggestions and complaints. Some fear that any suggestion will be looked upon as an unwarranted attempt to tell the builder that the user knows more about machines than the builder does. Others feel that the builder should possess perfect knowledge about his own machine, and that if some of the details are not what the user desires, it is up to the user to choose the machine of another builder when again in the market. Why should he, the user, help make a better machine available to competitors?

Here, as in so many other instances, the solution of the puzzle lies in co-operation between those whose mutual interests are really identical.

SHOP EQUIPMENT NEWS

Buhr Inverted-Type, Multi-Head, "Super" Production Drilling and Boring Machine

FREEDOM from chips around the cutting tools is assured by the inverted-head construction of the multi-head production drilling and boring machine announced by the Buhr Machine Tool Company, Ann Arbor, Mich. In this machine, the index fixture is mounted on top of the machine and is operated through a bevel gear and pinion by a hand-wheel. Either automatic or semi-automatic operation may be had through a button located at the right of the operator. The drills or boring tools feed upward to the sixteen pieces, which are held in a four-position index fixture, with four pieces to each position. The first or front position is used for loading and unloading; the second position for rough boring holes $1\frac{1}{4}$ in. in diameter by $3\frac{3}{4}$ in. deep in four pieces; the third position for finish boring the same holes, and the fourth position for reaming the four holes. The time required per cycle is 44 seconds or 11 seconds per piece.



Buhr Inverted-Type, Multi-Head, "Super" Production Drilling and Boring Machine, which is designed especially for the drilling or boring of deep holes

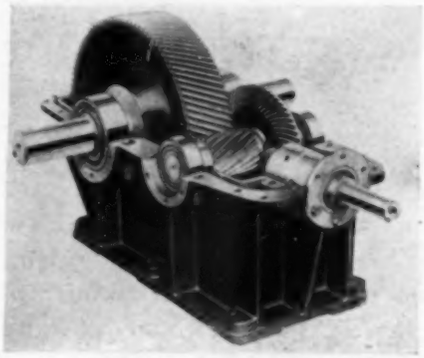
This method of using tools feeding up into the work is well adapted to the use of pilots on the cutting tools, inasmuch as the pilots are above the work and no chips or grit can get into them. The machine is best suited for either drilling or boring long holes. Other operations, such as counterboring, hollow-milling, and facing, can be performed.

The cycle consists of rapid approach to the work, regular predetermined feed, and rapid return to the starting position. The feed may be stopped at any point by means of a foot pedal. A safety clutch is built into the feed shaft with an adjustment for maximum load allowed on the tools. Any load in excess of that for which the machine is set will cause the feed to be stopped automatically. Pick-off gears are provided.

Gears and shafts are mounted on either Timken tapered roller bearings, double-row ball bearings, or Hyatt roller bearings. All sliding shafts that transmit power to heads are splined. The weight of the machine, without fixtures, is 20,000 pounds, approximately.

Falk Right-Angle Drive

To supplement its line of parallel shaft drives, the Falk Corporation, Milwaukee, Wis., has brought out a line of right-angle speed reducers, which includes both the horizontal and vertical shaft types. One feature of the right-angle drive is the combination of single helical and spiral bevel gears. It is claimed that the use of a single helical gear for the final reduction makes the drive easier to assemble and that the combination with a spiral bevel gear makes a quiet, cool-running reducer, which has an initial efficiency of 95 per cent or better.



Falk Right-Angle Drive, which is available in sizes from $\frac{1}{2}$ hp. at 100 r.p.m. to 565 hp. at the same speed

The reversible construction of the gears and shafts is another feature. If the gears become worn, the shafts can be turned end for end to permit using the opposite and unworn sides of the teeth. The lubricating system is simple and self-contained. A continuous splash keeps a film of oil on the faces of the gear teeth at all times.

Ratings of this line of right-angle reducers range from $\frac{1}{10}$ hp. per 100 r.p.m. on the smallest unit to 565 hp. at 100 r.p.m. on the largest size. Reduction ratios are from 15:1 to 518:1. A complete line of welded-steel motor beds has been developed.

"Kipp" Air Grinder

A small air-operated die grinder, a little larger than a pencil and operating at 40,000 r.p.m., has been developed by the Madison-Kipp Corporation, Madison, Wis. This tool is suitable for finishing irregularly curved surfaces in die cavities and also for touching up such surfaces after hardening. Another application is the grinding of such tools as end

mills and reamers for accomplishing certain desired results. Still another use is the finishing of form tools for use on lathes or shapers.

Although the grinding wheels used upon this tool rotate at 40,000 r.p.m., and the surface speed is 5,000 ft. per min., it is claimed that efficient operation is obtained with only slight wear. Various forms of polishing wheels

"Kipp" Air Grinder

may also be employed on the device.

From the accompanying illustration, it will be seen that the overall length of 8¼ in. and the general shape of the tool permit it to be held conveniently much like a pen or pencil. The barrel, being thicker than the ordinary pen, fits the operator's hand nicely, so that only a light grip is necessary. The weight of 12 ounces minimizes drag on the operator's hand and facilitates a sure, steady grip.

As mentioned previously, the tool is operated by air. In the housing at the upper end there is located a turbine wheel, which is carried on the spindle, and to which compressed air is admitted through four equally spaced ports in the housing. This air is led from the housing through inclined nozzles to impinge upon the closely spaced vanes on the wheel. A one-fourth turn of a knurled knob on top of the housing provides means for opening or closing the port that admits compressed air to the turbine wheel. By using a close spacing of the vanes on the turbine wheel, and the use of four intake ports, it is possible to obtain a speed of 40,000 r.p.m. on the spindle without vibration. The air is passed down through the barrel of the tool and escapes through exhaust ports at the lower end, in such a manner that it blows away the grindings and abrasive dust.

By the combination of proper bearing design and lubrication, the bearings are prevented from freezing at the high speed of 40,000 r.p.m., even though the tool has been in operation for some time. At the upper end, the spindle is carried in a ball bearing provided with seals for retaining sufficient lubricant to last for six months' operation. The lower end of the spindle is mounted in a bronze bushing. A wick running through an axial hole in the spindle holds sufficient lubricant for one hour's operation. Centrifugal force throws this lubricant out from the wick and through a cross-hole in the spindle to the lower bearing.

Frew No. 6 Vertical Two-Spindle Profiling Machine

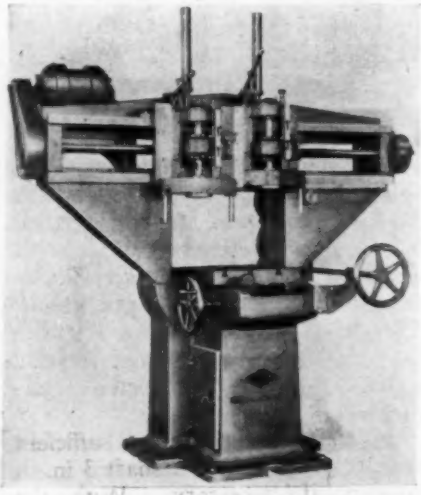
A CLEARANCE between the uprights of 25½ in. and a distance of 11¼ in. between the table and the crossrail illustrates the capacity of the No. 6 profiler, announced by the Frew Machine Company, 124 Venango St., Philadelphia, Pa. The height between the table and the crossrail can be increased to meet the customer's requirements. Both spindle slides are provided with guide pins so that a master former can be set up on the fixture. The cutter will then duplicate the required shape in the work. One spindle is also fitted with an extra guide pin so that a master former can be made by using a sample piece in the work position.

The drive to the spindle is by means of a backshaft, which runs through the cross arm, and which is driven itself by either belt or motor. The backshaft is geared to the spindle drive shaft by means of pick-off gears, thus permitting spindle speeds from 150 to 840 r.p.m. The spindle drive shaft carries hardened and ground spiral gears meshing with similar gears on the spindles. Ball thrust bearings are provided to take all thrusts. The spindles themselves run in Timken tapered roller bearings, and the cross movement of the spindles is controlled by means of a handwheel at the front. This handwheel operates the cross movement through a train of gears and also a rack attached to the cross-slide. The gears are split to take up backlash.

Vertical motion of the spindle throughout 4 in. is controlled by means of a hand lever, the weight of the slide and the spindle being carried by a spring counterbalance. A lock notch stop, with micrometer adjustment, on this slide holds it in the desired position.

Longitudinal movement of the table through 24 in. is made by means of a handwheel at the left-hand side of the machine. It is actuated through a gearbox and rack. These gears and the rack are also split in order to offset any backlash. When specially ordered, the handwheel can be placed on the right-hand side of the bed. Also, on special order, a table 37 in. long by 23 in. wide can be provided.

Specifications: Working surface of table, 24x20¾ in.; movement of cross-slide, 42 in.; distance between spindles, 15⅝ in.; center distance between spindle and guide pin, 7 in.; spindle taper, No. 10 B&S.; speed of pulley shaft, 300 r.p.m., horsepower required, 3; floor space, 48x82 in., and the weight, about 4,000 pounds.

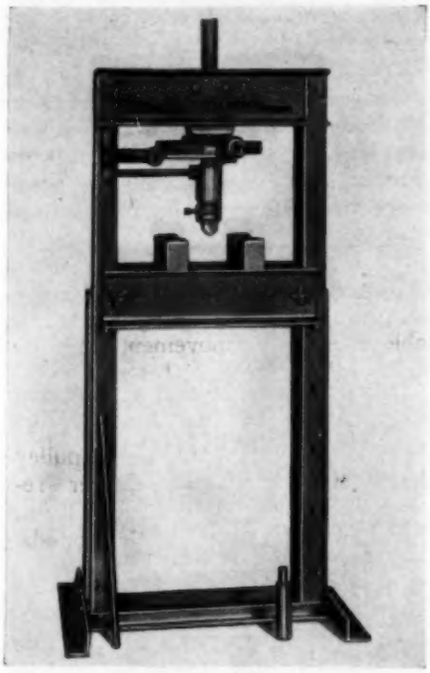


Frew No. 6 Vertical Two-Spindle Profiling Machine

Simplex "Utility" Press

Pressures up to 80,000 lb. can be exerted in this press, which has been developed for toolroom and machine shop use by the Simplex Tool Company, Woonsocket, R. I. Three different leverages, each having a different speed and power can be obtained. The low speed has a power of 4,000 to 1. A ratchet wheel is mounted on ball bearings for ease in spinning the plunger to and from the work, and there are five quick height adjustments.

In the toolroom it is suitable for shearing soft punches in hardened dies and for trying out forming, blanking, piercing, and bending dies. It is also useful for making stops or



Simplex "Utility" Press

supports that extend where the piece is longer than the width of the die. The press will bend cold a piece of steel ½ in. thick by 4 in. wide to a 90-deg. angle, the piece having a better appearance than a forged article. The press is also suitable for use in pressing posts in dies or for pressing in pieces wherever a press fit is required.

The Simplex press has a sufficient pressure to straighten a shaft 3 in. in diameter if necessary. With the angle nose and V-blocks in place, it is suitable for straightening shafting or bars of all kinds, pipe, tubing, and pieces warped in hardening.

The equipment includes two combination blocks, which are used as parallels, straightening V's, and bending dies as follows: one V-nose for straightening and bending, one plain nose, and one bar.

Specifications: overall height, 60 in.; width between the frame, 21 in.; travel of screw, 8 in., and space between side members, 4¼ inches.

Biax "Supra" Flexible-Shaft Machines

Two sizes of the "Supra" flexible-shaft machine have been developed by the Biax Flexible Shaft Company, Inc., 20 East 17th St., New York, N. Y. These units, ½- and 1-hp. capacities, are suitable for the production grinding, drum and disk sanding, snagging, filing, wire brushing, buffing, polishing, drilling, and other cutting and cleaning operations on ferrous and non-ferrous metals, Bakelite, fiber, and rubber. Both units can be supplied in the overhead suspended type with either a saddle hook or a trolley for the monorail system.

Complete with a roller floor stand, the unit weighs 60 lb. The motor is furnished for 110- or 220-volt a.c. single-phase, 60 cycle circuits, or 220-volt d.c. or 220-volt 3-phase, a.c. circuits. It is equipped complete with a switch cord and plug ready for operation.

The ball-bearing equipped countershaft is of the eccentric type and constitutes, in combination with the index arrestor, a quick-change device, which is positive and self locking. The pulleys are of the Woodruff keyseated and locked type. All of these moving parts are kept away from the operator at all times.

Drive is by means of an endless, molded V-type belt. The flexible shaft is of the cold-wound type, the smaller machine having one with a ½-in. core 6½ ft. long, and the larger, a ⅝-in. core 7 ft. long. Either shaft is equipped with a metallic casing covered with vulcanized rubber to prevent grease leakage and to insure against scratching the polished work.

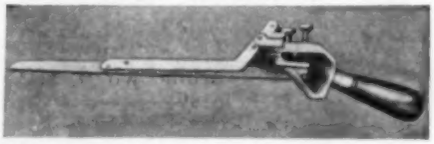
The ball-bearing handpiece for grinding and steel wire brushing is attached to the flexible shaft by a quick-change ball-bearing jaw con-

Biax ½-Horsepower "Supra" Flexible-Shaft Machine

nection, which permits interchanging the various handpieces and right-angle attachments with a minimum loss of time. The flexible shaft speeds of the unit are 950, 1,750 and 3,500 r.p.m., which permit the use of almost any portable rotary tool. The tools taken are as follows: circular sanding disks, 6 to 9 in.; rubber sanding drums, 4 x 2 in., 3 x 3 in., and 3 x 1⅝ in.; grinding wheels up to 6 x 1 in.; steel wire brushes up to 6 x 1 in.; circular felt buffs up to 9 in. when used with a right-angle gear, and drill chucks up to ⅜ in. in capacity.

Rogers "Quad 4-in-1" Hacksaw

Provided with means for four different set-ups in order to get into tight places, the "Quad 4-in-1" hacksaw has been placed on the market by the Rogers Products Company, Inc., Jersey City, N. J. When set up as a regular hacksaw, it will cut to a depth of 1¾ in. For cutting between closely spaced parts, the frame



Rogers "Quad 4-in-1" Hacksaw

may be inverted so that the blade and the supporting member are practically in line and superimposed. The saw therefore can be entered in holes little larger in diameter than the saw blade width. By another set-up the blade is held against either the right or left-hand side of the frame nose so that a projection can be sawed off flush with the surrounding surface. In the extended blade position, shown in the illustration, a special Quad blade with a long pointed tip is used. The device is thus able to cut curves or work in closer quarters than the second case mentioned.

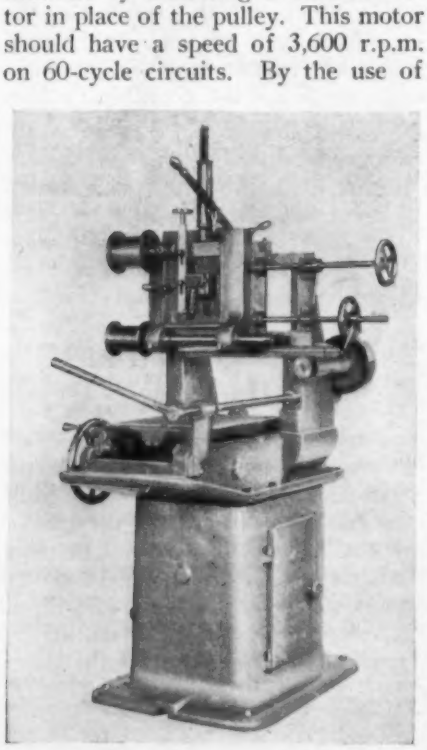
Frew Improved No. 3 Horizontal Two-Spindle Profiling Machine

The No. 3 horizontal profiling machine, which has been developed by the Frew Machine Company, 124 West Venango St., Philadelphia, Pa., is intended for working wood, fiber or other soft material for which a high spindle speed is desired. The spindle is carried in ball bearings, and on the belt driven machine it runs at 4,500 r.p.m. Direct motor drive can also be furnished for this machine by mounting a built-in motor in place of the pulley. This motor should have a speed of 3,600 r.p.m. on 60-cycle circuits. By the use of a frequency changer and a suitably designed motor, the motor speed can be increased to 7,200 r.p.m. on 120-cycle circuits.

The spindle is mounted in a slide, which has a total movement of 3¾ in., and which is raised and lowered by means of a hand lever, the weight of the unit being counterbalanced by means of a spring. This slide is provided with an adjustable lock stop, so that when the operator has pulled the spindle down the desired distance, the lock will hold it at that height. The cross movement of the spindle through 3-in. on the rail is made by means of the hand lever at the front. This lever actuates a train of gears which are double cut in order to take up backlash. Stops are provided on the crossrail to facilitate setting in the position desired.

Table movement is controlled by means of the handwheel at the side of the bed. It is operated through a gearbox driving a split rack on the bottom of the table. In order to take up backlash of these gears also, they are carried on eccentric bearings.

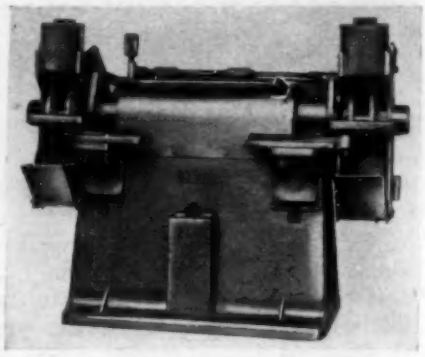
Specifications: Working surface of table, 12 x 15½ in.; movement of table, 15½ in.; distance from table to spindle centers, 7 in.; distance between uprights, 16 in.; T-slot in table, ¾ x ¼ in.; largest diameter cutter, 6 in.; and weight 1,800 pounds.



Frew No. 3 Horizontal Profiling Machine which is a semi-special type for working wood, fiber and other soft materials

Ransom Type MRW Heavy-Duty Grinder

Two 24x4-in. wheels of 2½-in. bore are mounted on this Type MRW heavy-duty grinder announced by the Ransom Manufacturing Company, Oshkosh, Wis. Texrope drive with an extra strand is provided, a 7½-hp., multi-speed motor furnishing the drive. The speeds are 900, 1,200 and 1,800 r.p.m. A three-button switch arranged with padlocks is provided for obtaining the proper wheel speed. Average wheel speeds for the above individual motor speeds are 1,025 r.p.m. for 24-in. wheels, 1,367 r.p.m. for 18-in. wheels, and 2,050 r.p.m. for 12-in. wheels. These speeds are effected by means of the top, middle, and lower push buttons, respectively. Only one of these buttons is supposed to be unlocked at any time, the person responsible for securing the proper wheel speed retaining the key for the padlocks.



Ransom Type MRW Heavy-Duty Grinder

At a slightly additional charge, a controller device, which has to be lowered before the wheel can be changed, can be attached below the wheel. The controller arm operates a selective switch automatically, the switch giving the right speed for the diameter of the wheel employed. There are no pulleys nor gears to remove or change. A full line of these machines is made for both vitrified and high-speed wheels to run at 9,500 surface feet per min., and for wheel sizes from 18 to 36 in. in diameter.

Morse Flexible Couplings

The feature of the flexible couplings announced by the Morse Chain Company, Ithaca, N. Y., is that they consist of two sprockets encircled by a Morse silent chain. This chain is held in place by a guide groove in one sprocket, while the other sprocket is free to float under the chain. The full floating principle employed relieves the adjacent shaft bearings of possible thrust strains by permitting freedom of end play. In addition, the flexibility of the chain relieves the coupling pinions of a great deal of the shock and bind-

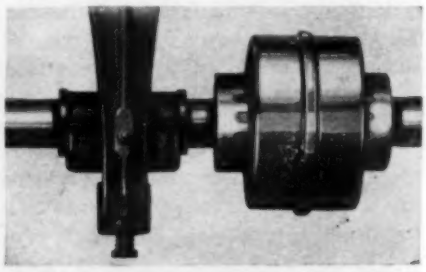


Fig. 1—Morse Flexible Coupling equipped with spun metal cover to retain lubricant

ing that accompanies starting, and consequently reduces excessive wear on the coupling parts.

The chain links are hardened and drawn to give minimum wear with extreme toughness without becoming brittle, and these links run on case-hardened pinions. Rockers and seats are also casehardened.

Inaccuracies of alignment of the connected shafts are taken care of by the flexibility of the chain. Small clearances between the pins and the links, and between the links themselves, permit sliding of the links relative to each other. Also, relative motion is possible between the sprockets and the chain, which is

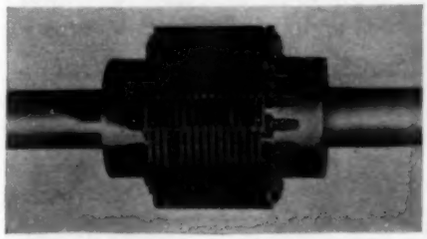


Fig. 2—Assembly of Morse flexible coupling

self-centering due to centrifugal force. Some couplings have shearing pins to prevent overloading of the machine. Other combinations of couplings with clutches, clamp hubs, and spring sprockets have been worked out for special cases.

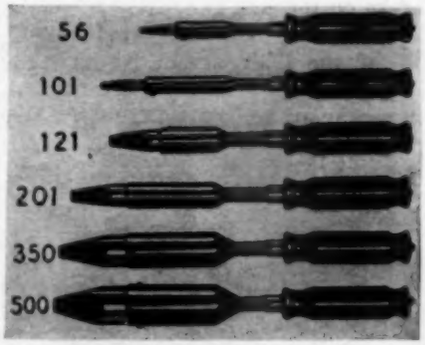
In Fig. 1 is shown a complete coupling with an oil-retaining, spun-metal cover, whereas Fig. 2 shows the usual assembly of the coupling as frequently run without the above cover. In the usual installation of this spun-metal case, the case is separated from the chain by a layer of felt whose purpose is to hold oil and to insure silent operation. The metal case is self-centering and requires no bolts nor machine screws. When the coupling is used in hot, wet, or gritty atmospheres, these cases are especially recommended to prolong the life of the coupling.

The New Process Twist Drill Company, Taunton, Mass., now has ready for distribution, and will furnish gratis on request, a metal gage giving the correct 59-deg. angle for properly sharpening or re-pointing twist drills.

"Esico" Industrial Electric Soldering Irons

A range of soldering irons for all industrial purposes and designed so that the heating elements are replaceable without discarding the case, terminal, and other parts, has been placed on the market by the Electric Soldering Iron Company, Inc., 135-139 West 17th St., New York, N. Y. Another feature is that the end of the heating element is so designed that the tip seat does not deteriorate with use, so that when tips wear down close to the element, it is only necessary to tap them with a hammer and unscrew them. The element is mounted in the case and secured with set screws, so that it is not possible for it to turn when tightening or loosening tips. It is possible to remove the element from the case for replacement or inspection.

The tips are machined accurately to fit the heating element and to insure good heat conduction from the element to the tip. A nickel-chrome resistance wire is employed for winding the element and the insulation is of mica. The blued steel case is of one piece, minimizing the possibility of loosening the parts. It is shaped so that the weight is distributed in order to effect good balance. The handle is turned from



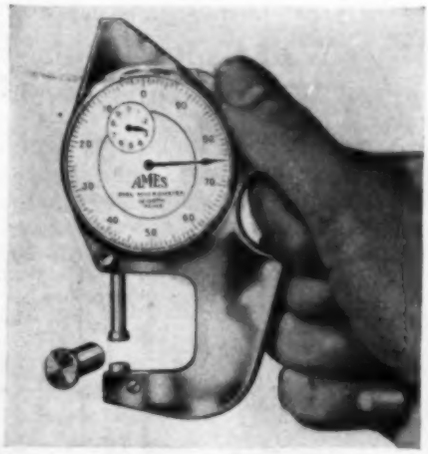
"Esico" Industrial Electric Soldering Irons

wood and is shaped to fit the hand.

The six sizes of soldering irons illustrated are representative of the six different types manufactured. The smallest size illustrated is for light work, such as soldering fine wires in radio factory operations; the second is suitable for telephone switchboard assembly; the third for light tin work; the fourth for medium tin work; the fifth for heavy sheet metal work, and the last for very heavy soldering of large tanks or cans. The overall lengths range from 10½ to 14½ in.; the weights, exclusive of cord, from 6 to 54 oz., and the tip diameters, from ⅜ to 1⅝ inches.

Ames Dial Micrometer

Easier reading to thousandths and parts of thousandths by means of widely spaced dial graduations is the chief feature of the dial indicator micrometer placed on the market by the B. C. Ames Company, Waltham, Mass. Two dials are employed. The smaller indicates the revolutions of the large pointer, each graduation of the small dial representing 0.1 in. The large dial has 100 widely spaced graduations around the dial, each representing 0.001 in. The tool can be used for measuring and testing



Ames Dial Micrometer

round, flat or odd shaped machine parts, sheet metal, wire, and other products. The range is to 1 inch.

The tool is designed for convenient holding when measuring pieces or when in use as a snap gage. It is held upright by means of the index finger through the finger ring grip and the wheel at the top is moved upward to raise the anvil. After the anvil is raised sufficiently to permit inserting the piece between the upper and lower anvils, the thumb pressure is released on the toothed wheel, and the upper anvil closes of itself on the part being measured. By operating the spindle lock, the tool may be used as an adjustable snap gage.

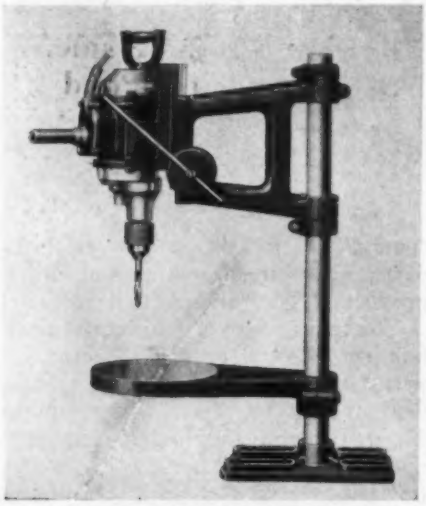
Semi-Annual Shop Equipment Review—*Corrections*

In the Semi-Annual Shop Equipment Review Number for January 16, a transposition of cuts occurred on page 134 of the Woodworking Equipment section of the American Review. Although the cuts wrongly placed are of such different equipment and are placed so closely together as to make identification easy, the following information is given in the interest of readers and in fairness to the manufacturers concerned: Item No. 353 should have been illustrated by the cut used with Item No. 354; Item No. 354 should have shown the cut placed with Item No. 355, and Item No. 355 should have included the halftone used with Item No. 353.

Item No. 395 on page 138 should have read "Valve control for air cylinders," not "Valve control for hydraulic cylinders."

Hisey-Wolf Radial Drilling Stand With Sensitive Feed

A radial drilling stand with sensitive feed can be furnished by the Hisey-Wolf Machine Company, Cincinnati, Ohio, to take all portable electric drills of its manufacture up to



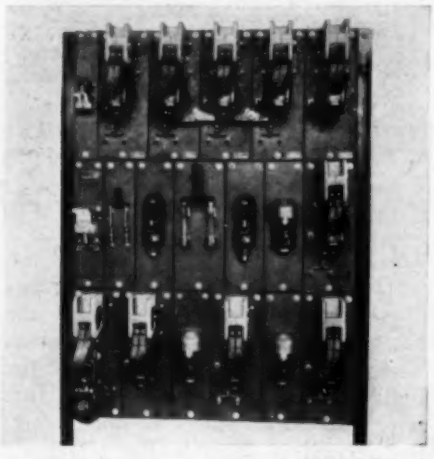
Hisey-Wolf Radial Drilling Stand with Sensitive Feed

and including the $\frac{7}{8}$-in. size. The lever feed of this device is operated through a rack and pinion in a manner similar to a drill press, thereby permitting positive and sensitive control without fatigue to the operator. The motor holding brackets are designed so that the portable drill can be attached without removing any part.

The vertical adjustment without resetting is $7\frac{1}{2}$ in. and the vertical adjustment up and down on the main column is 13 in. The total vertical adjustment is $20\frac{1}{2}$ in. The diameter of the main column is 2 in. and the arm will swing in a complete circle. In addition, maximum arm reach from the column to the drill spindle is 13 in. The drill stand weighs 150 lb. This radial drilling stand is also made with suitable wall brackets.

"Wright" Dynamic, Lowering Circuit Controller for Crane Hoists

A magnetic contactor type of crane hoist controller, known as the "Wright" dynamic lowering circuit controller, has been placed on the market by the Electric Controller & Manufacturing Company, 2700 East 79th St., Cleveland, Ohio. According to the manufacturer, the solenoid brake release is not sluggish in the lowering direction, and, therefore, it is not necessary to pause on the first point to give the brake an opportunity to release before advancing the controller. Instead of passing only one-third of the line current through the brake on the first contact point of the lowering controller, this circuit passes all of the line current through the brake. Therefore the operator can move the master controller to give any desired speed. This improvement



"Wright" Dynamic, Lowering-Circuit Controller for Crane Hoists

insures faster crane operation, more accurate control of short, quick movements, and better ability to spot loads.

Other advantages are: Faster speed when lowering light loads or an empty hook; greatly reduced power consumption on all loads at all speeds; more power returned to the line when lowering overhauling loads; reduced peaks of current; less heating of the motor; less contactor wear, and fewer movements required when inching for accurate stopping of the load. All of the above features are obtained without additional contactors.

This crane hoist controller, as illustrated, makes use of both "E.C.&M." shunt contactors and time-current acceleration relays. It is also usually supplied with a Type NT master switch and nickel-alloy grid resistors.

TRADE PUBLICATIONS

CALIPER, DIAL. The United Tool & Die Co., 324 Ann St., Hartford, Conn., has published a folder on its dial caliper for measuring drawn work, forgings, and castings.

KEYSEATERS. Mitts & Merrill, Saginaw, Mich., have published a loose-leaf catalog showing the various styles of the new "Giant" keyseater, together with specifications and data on various attachments. Each style is illustrated.

LATHE ATTACHMENTS. The South Bend Lathe Works, 426 East Madison St., South Bend, Ind., has published bulletin No. 77, devoted exclusively to the description and illustration of the attachments used with "New Model" lathe. The catalog gives specifications and factory prices. It contains twenty 11x8½-in. pages.

PUMPS, ROTARY. The Beach-Russ Co., 50 Church St., New York, N. Y., has published Bulletin No. 39 on the rotary pumps of its manufacture. Included among the items are acid-resisting pumps, and bronze gear pumps.

FEDERAL SPECIFICATIONS. The U. S. Department of Commerce, Bureau of Standards, has issued circular No. 378, entitled "Alphabetical Index and Numerical List of Federal Specifications Promulgated by the Federal Specification Board, complete to November 1, 1929". This circular contains eighteen 9x6-in. pages. It can be obtained from the U. S. Government Printing Office, Washington, D. C., for five cents.

NEWS
OF THE WEEK

American Industrial Machinery Exports Break All Records Since 1920

Total of $257,000,000 reached, approaching $1,000,000 per working day

By L. J. Cochrane

Industrial Machinery Division, Bureau of Commerce

OUTDISTANCING all previous records since the more or less abnormal postwar year of 1920, foreign sales of American industrial machinery during 1929 totalled over $257,000,000, thus approaching $1,000,000 per working day. Such sales total only slightly less than those made in 1919 when the postwar sales boom was at a high level, substantially exceeded business done in 1921 when the postwar boom, though waning, was still in effect, and are considerably more than double the sales made in either 1922 or 1923, the first two years of the lean period which followed the collapse of the postwar boom. Moreover, as compared with 1928, exports during 1929 showed an increase of 22.7 per cent, and range from 40 to 96 per cent above business done in the intervening years of 1924 to 1927, inclusive. For the period since 1919, American exporters have sold $2,139,887,000 worth of industrial machinery abroad, or a yearly average of $194,535,000 as compared with $49,117,000 and $87,129,000 during the prewar years of 1910 and 1913 respectively. This is an imposing advance, even when the decreased value of the dollar after the war is taken into consideration.

Added significance is given to these achievements when it is considered that this steady and sometimes rapid progress has been made in the face of sharp competition from other machinery manufacturing nations who, suffering from overproduction at home and the necessity of disposing of their surplus on world markets, have been offering unusually attractive credit and price inducements to foreign customers. However, despite this and many other obstacles, American manufacturers, on a quality basis, and especially with high-speed, high-production, machinery, have been able to increase their business to the marked extent indicated, not only in the open market offered by nations only partially industrialized, but also in the very heart of competitor's territory, although American prices are uniformly higher than those quoted by competitors. This is due largely to the fact that foreign buyers are coming more and more to realize that per dollar invested they eventually receive a larger return from the high-quality American machine than from the cheaper foreign article.

Among the principal lines of American industrial machinery, exports of metal-working machinery led all others in 1929, totalling almost $41,000,000. Foreign sales of this item, after slumping somewhat in 1926, have been tending steadily upward during the past three years and in 1929 exceeded those for the previous year by 19 per cent and for 1927 by 63 per cent. Markets for American metal-working machinery are found practically all over the globe, but as might be expected, the principal customers are the more highly industrialized nations or those seeking to become industrialized, such as Canada, United Kingdom, France, Germany, Japan, Russia, Belgium, Italy, and Czechoslovakia.

Foreign sales of American construction and conveying machinery were second only to those of metal-working machinery during 1929, totalling almost $26,500,000. This was over twice the amount exported in 1925, and represents the high mark so far reached in the steady upward march of foreign demand for this type of equipment, which accounted for sales of more than $17,000,000 in 1926, more than $19,000,000 in 1927, and almost $22,800,000 in 1928.

Internal combustion engines was another item in which foreign demand, which has been climbing steadily during the past few years, took a sudden turn upward in 1929. Sales in that year totalled well over $11,300,000, which besides being 26 per cent over those of 1928 and 46 per cent over those of 1927, were double the volume reached in 1926 and considerably more than double that for 1925.

Among the various items of metal-working machinery, sales increases were general for 1929, as compared with the previous year, being particularly notable in the case of lathes, vertical boring mills and chucking machines, thread-cutting and automatic screw machines, gear-cutting machines, internal grinding machines, sheet and plate metal-working machines, foundry and molding equipment, pneumatic portable tools, and drills and reamers. In addition, exports of forging machinery nearly doubled and those of rolling-mill machinery nearly tripled. Business fell off, however, in the case of external cylindrical grinding machines, and there was a slight decrease also in sales of vertical drilling machines.

For the month of December alone, exports of American industrial machinery totalled some $19,528,000, as compared with approximately $20,000,000 in November, thus continuing the downward trend noticeable toward the end of the year. However, as compared with December, 1928, exports increased by nearly 5 per cent.

* * *

NEC Heads Confer With Commerce Officials

Leaders of divisions of the New England Council conferred, on Jan. 30, with officials of the U. S. Department of Commerce in Washington, explaining the progress of the past year in various endeavors, and the effect of the Council plan upon the industrial life of New England as a whole. The leaders agreed that the Council has served to improve and strengthen relations between business of the various states composing it, but admitted that the efforts of the Council during the coming years would be directed toward increasing this cooperation and making it more effective.

* * *

Horner Leaves Presidency Of Niles-Bement-Pond

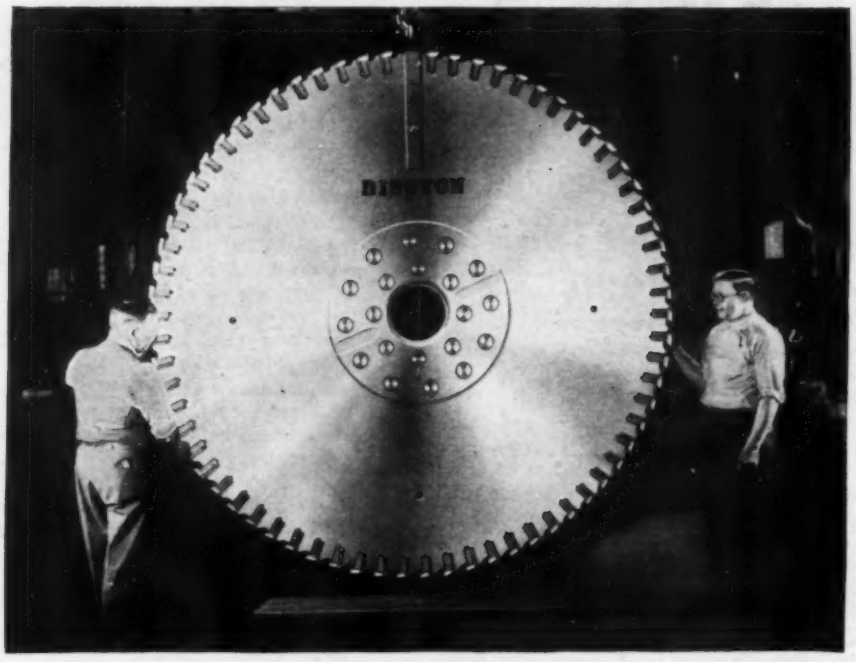
Leonard S. Horner, president of the Niles-Bement-Pond Co., New York, resigned, on Feb. 1, to take part in the industrial activities of the Kissel, Kinnicutt Co., 14 Wall St., New York City. He continues as a director and a member of the executive committee of the Niles-Bement-Pond organization.

* * *

Deere & Co. Honors 350 Five-Year Employees

Deere & Co., Moline, Ill., was host to 350 employees of the John Deere Harvester Works, its three Moline factories and the John Deere Plow Co. at the annual service party last week in the Elks' club, Moline. Gold watches were presented to William Quick of the John Deere Wagon Works and C. A. Carlson of the John Deere Plow Works, both of whom have completed 50 years service in the company. They, with John Kiel, 55-year employee of the John Deere Plow Works, were guests of honor.

One of the World's Largest Metal-Cutting Saws



This 110-in. metal-cutting saw, ¾ in. thick, weighing approximately 1¼ tons, has just been completed by Henry Disston & Sons, Inc., for the Midvale Co., for use in cutting giant steel forgings. Flanges 35 in. in diameter and 2 in. thick carry the slots into which the driving keys fit

* * * *

Washington Looks at the Engineer—Gage Design Standard Ready for Publication—Depreciation and a Conference—All for Eleven Cents—An Auto Embargo?

By Paul Wooton

Washington Correspondent, American Machinist

WASHINGTON, D. C., Feb. 5—The engineer takes justifiable credit for having pointed the way to the economies that have brought production costs to lower and lower levels. Now it is being claimed that it is the entry of the engineer into distribution that is responsible for similar progress in that field. With the rise of mechanization in distribution processes, the engineer had a chance to see behind the scenes. He missed the orderly management of manufacturing plants, of mines, and of construction operations.

The report of the American Gage Design Standard Committee, prepared by three years of co-operative work between representatives of industry and of the government, soon will be available for official publication. An unusual fact about the report which standardizes and simplifies the whole field of machine gage work, is that it was put into practice before its final approval and publication. The rapidity with which the rules have been formulated and adopted is considered as an encouraging sign toward the continued development of standardized practices in other industries. Already, abstracts of the rules are included in the 1930 catalogs of three prominent companies, Pratt & Whitney, Taft-Peirce, and Greenfield Tap & Die. This work covers plain, plug, and ring gages of diameters from 0.059 in. to 4½ in., which sizes include the bulk of production. The committee's chairman is Col. J. O. Johnson, also a member of the National Screw Thread Commission.

The fifth conference of representatives of machinery and equipment associations was held on Monday, Feb. 3, at the United States Chamber of Commerce Building. As a result of the last meeting, held in November, an arrangement had been made so that the delegates consulted with officials of the Bureau of Internal Revenue on Feb. 4 to discuss depreciation data. The Bureau statistics on depreciation are not yet ready for general release, but were in shape to be discussed with representatives of the industry, from whom recommendations were invited. Other subjects on the program were: Control of the trade-in evil, uniform cost accounting, time sales, promotion of standards, cross licensing of patents, market research, stabilization of employment and production, and other pertinent problems.

In a solemn four-page ruling, the U. S. General Accounting Office has instructed the U. S. Department of Labor that it overpaid one of its bills by eleven cents. The issue arose over a correction made in a voucher by clerks at the Labor Department. Some material had been purchased to the value of $5.53. The supply house, however, made a slight error in multiplying the amount on the bill and made it read eleven cents less than it should have been.

Labor Department employees caught the mistake and revised the amount on the voucher to the correct figure. As the result, Comptroller General McCarl has become aroused at what he regards as the taking of undue liberties with official procedure. He has disallowed the payment of the eleven additional cents. Henceforth, he ruled "there must be no increase by way of correction or alteration in the total amount claimed on a voucher, unless such correction or alteration be made by the claimants and then only in the form of a new voucher for the correct amount claimed."

Having noted the official edict, the concern to which the eleven cents is due has decided to forego its payment rather than attempt to put a new voucher through the government's devious channels.

A survey of the fractional horsepower motors that are being used for various purposes is being considered by the electrical division of the Department of Commerce. Several requests have been received by the Department from firms contemplating the production of small motors, asking if information could be compiled showing the uses to which these motors are put. After discussing the matter, officials of the Department have become amazed at the dearth of information available.

American automobile manufacturers do not propose to urge adoption of retaliatory measures by the United States if France imposes proposed increases in tariff duties which amount to an embargo against American cars. Official assurance has been received from France that no legislative action will be taken until the American manufacturers' defense committee has had an opportunity to present to that government its reasons why such action would be shortsighted. If this is of no avail, a retaliatory duty on French cars would serve no purpose, as imports are practically nil. Prohibitive tariffs on other French products largely consumed in this country would not benefit the automobile industry. It might damage others indirectly, as restriction of the sales of French producers in the United States would tend to reduce French import purchasing power for American products. The injury that would be done is more potential than real. American manufacturers fear restrictive policies by other nations.

* * *

THE Seventeenth National Foreign Trade Convention, under the sponsorship of the National Foreign Trade Council, will be held at the Biltmore Hotel, Los Angeles, Cal., on May 21-23. O. K. Davis, India House, Hanover Square, New York City, is secretary.

Chicago Auto Show Draws 40,000 At Opening

Record crowds of visitors at the 30th annual National Automobile Show at the Coliseum, Chicago, last week, reacted more than ever to the mechanical triumphs in automotive engineering which were so much in evidence at the New York show. Technical discussions of the 16-cylinder engine, front-wheel drives, 4-speed gearsets, and the relative merits of eights and sixes were principal topics of conversation.

The motoring public is becoming more conscious of its fundamental interest in what lies beneath the hood. Style seemed secondary for the moment in the eyes of visitors, and the cutaway engines and chassis were centers of interest all of the time.

Attendance on Sunday, the opening day, was 40,000 proving the popularity of a Sunday opening. Many of the visitors thronged the shop equipment section of the show, a larger percentage of the attendance than ever before. The accessory and parts displays were also increasingly popular, indicating the unusual interest of the public in things mechanical.

* * *

New England Foundrymen Elect Officers for 1930

E. F. Stockwell of the Barbour-Stockwell Co., Cambridge, Mass., was elected president of the New England Foundrymens' Ass'n at its 34th anniversary celebration recently at the Exchange Club, Boston. L. J. Anthony of the Glenwood Range Co., Taunton, Mass., was elected vice-president, and G. H. Gibby of the Gibby Foundry Co., East Boston, was chosen treasurer. E. F. Stockwell of the Barbour-Stockwell Co., Cambridge, was chosen secretary. Members of the executive committee are: W. D. Kent, Grinnell Co., Providence, R. I.; Albert Sweet, Milford Iron Foundry, Milford, Mass.; Roy M. Sherwin, Brown & Sharpe Manufacturing Co., Providence, R. I.; Fred D. Shaw, Walker-Pratt Manufacturing Co., Watertown, Mass.; C. A. Reed, Rogers Brown & Crocker Bros., Inc., Boston, Mass.

* * *

Pittsburgh Gets 1930 Safety Congress

Pittsburgh has been chosen as the location for the Nineteenth Annual Safety Congress from Sept. 29 to Oct. 4, according to an announcement of the National Safety Council last week. With the full co-operation of city officials and civic bodies pledged, the convention is expected to outstrip even the Congress held in Chicago last year, which attracted 7,000 delegates from all over the world.

A feature of this year's congress, according to preliminary plans, will be a day set aside and designated "Pennsylvania Day." All hotels will co-operate in handling the delegates, although the William Penn and Fort Pitt hotels will be headquarters for the meetings. A safety exhibit will be displayed in the basement of the William Penn Hotel.

* * *

C. B. Lord to Present Management Method

Chester B. Lord, associate editor, *American Machinist*, will present a paper before the management division of the Metropolitan section, A.S.M.E., on Feb. 7, under the title, "Management by Exception." The meeting will be held in the Engineering Societies Bldg., 29 West 39th St., New York City, with L. P. Alford acting as chairman. Planning, comparing, and visualizing in terms of a common demoninator make it possible to extend the exception principle to every field of management. Methods of doing this will be explained, and the talk illustrated.

* * *

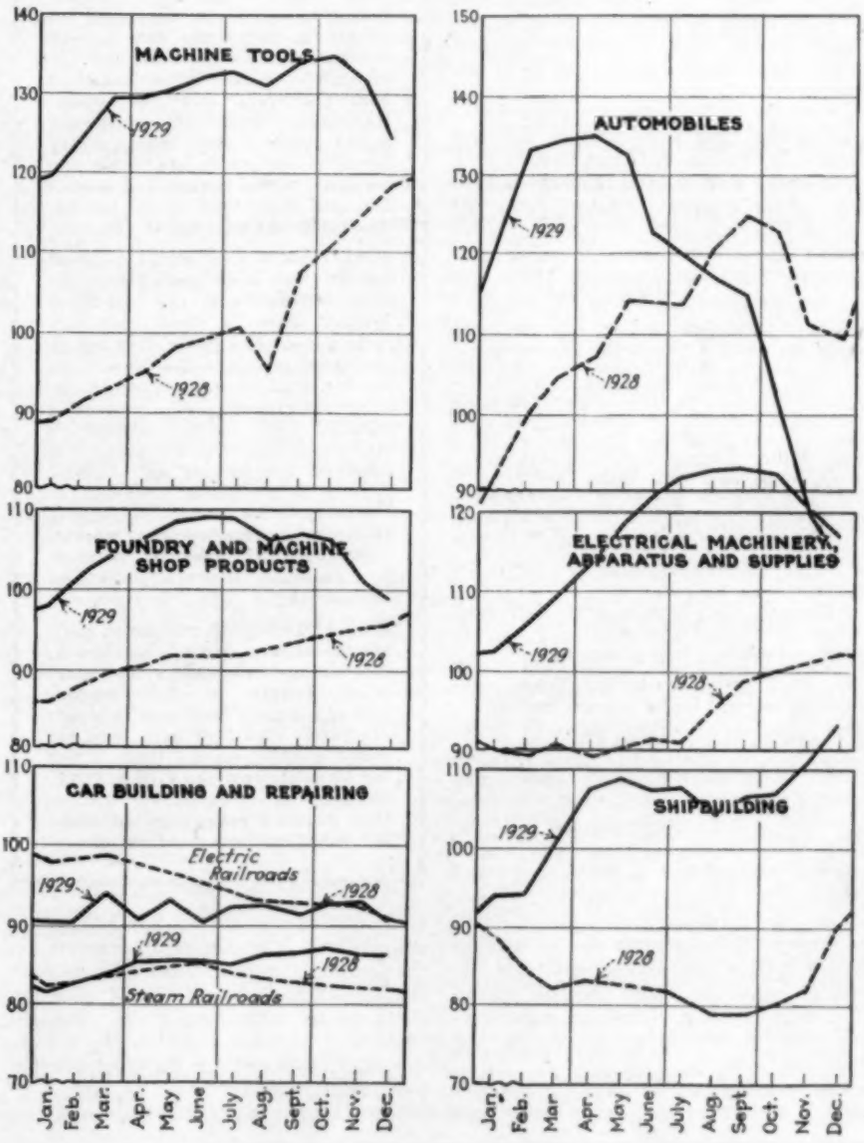
A COMMITTEE of representatives of manufacturers has been named in Canada to endeavor to draft an item for revision of Canadian customs duties which will permit a lower duty or free entry on manufacturing machinery when such machinery is not made in Canada.

* * * *

Trend of Employment in the Metal-Working Industries

Data Supplied by the Bureau of Labor Statistics

Monthly average for 1926 = 100



BUSINESS · BAROMETER

Prevailing cheerfulness and hopefulness augur a prosperous spring and summer, unless unseen weakness develops

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

"THIS Shrinking World," was the subject of a lecture delivered in New York last week. The lecturer stressed the rapidity of communication and transportation that has been made possible by electricity, and asserted that commercial development now follows scientific discovery with a promptitude hitherto unequalled.

Applying this statement to business and finance, he said that the logical result would be shorter periods of depression and longer periods of prosperity than have ever been known, and that the ease with which credit could now be mobilized made it impossible for hard times to last very long in the United States, or in any other country whose industrial organization is at all flexible.

Upon this theory, he argued that the present depression in Great Britain is a result of the lack of industrial flexibility, and that the industrial versatility of the United States is our safeguard against more than a few months of economic distress. In support of this claim, he laid special emphasis upon the hand-to-mouth buying that has become the general practice in America, as well as upon the short-term loans to which banks are now compelled to limit themselves in granting commercial credit. He also drew attention to the increase in employment and productive activity reported by President Hoover's Committee, and predicted that the so-called panic of 1929 would soon be forgotten in the greater prosperity by which it would be succeeded.

Although the lecture was delivered before an invited audience by a gentleman who prefers that his name be withheld, it greatly impressed those who heard it, and has had a pronounced effect upon opinion in high quarters here. One result has been a moderate advance in the stock market, where people are again commencing to ask what to buy. Another is the improvement in the value of bank stocks, from which it is inferred that there is no longer any chance of serious financial trouble among the banking institutions. Still another is the distinctly better feeling in the market for investment trust securities, many of which are still selling at less than their "break-up value" as indicated by current quotations for the securities held.

Exports of gold have practically ceased, and large shipments have been made to this country by South America and Japan. The decline in foreign exchange and the reductions in European Bank rates have led to talk of gold imports on an increasing scale. But the bankers of London and New York seem opposed to this and it is doubtful whether the quantity received will be large.

The London Naval Conference seems to have resolved itself into a diplomatic game of chess. It is likely to be played slowly, but the game in which they are engaged is well understood by all the players, and the best-informed correspondents seem to think that the advocates of unrestricted armament will be checkmated before the Conference adjourns.

Briefly, it may be said that the feeling in financial circles here and abroad is one of restrained optimism. While merchants are still circumspect in their buying, it is plain that commercial confidence is on the increase, and that trade is almost sure to expand if and as soon as it becomes reasonably certain that agricultural America will have a good season this year.

Meantime, and while waiting for the fruition of governmental farm relief, a quiet but constant improvement in business must be admitted. The steel mills are getting more orders. The automobile manufacturers are said to be planning increased production. The market for woolen fabrics is better. Cotton goods are also in steady demand, although the mills continue to complain.

Low-priced commodities, which include sugar, coffee, and rubber, are either being held firmly or bought freely, and an increased distribution during the spring and summer is expected. There is an excessive supply of coffee, but a large portion of it is likely to be absorbed on the decline, and stocks of sugar and rubber are not unmanageably large. There seems to be but little probability of any change in the tariff on sugar. Copper is, if anything, a shade easier.

The retail trade in the larger cities is remarkably good when the pessimistic predictions that have been made are considered, and the losses on the New York Stock Exchange do not appear to have adversely affected the purchasing power of the masses, although some rich people may have to live less luxuriously in the future. From the standpoint of the stoic, this is not to be regretted, although it may restrict the demand for expensive luxuries and costly superfluities.

Taking the situation as a whole, the cheerfulness and hopefulness that prevail are remarkable, and they augur a prosperous spring and summer, unless a weakness that is now unseen develops.

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95 Broad St., New York

From this page the reader will get a quick picture of current business and industry. The boxed material below is a summary of the letters from regional correspondents of the American Machinist, published in full on the opposite page.

IMPROVEMENT in the machinery and machine-tool market is indicated by reports, real orders having begun to follow the inquiries that characterized the first three weeks of January. An encouraging sign is the continued increase in inquiries, the greater number of tools on each, and the generally optimistic attitude of both the trade and the buyers. Railroads, electrical equipment manufacturers, and other manufacturing industries are doing the majority of the buying and inquiring, and it is from these sources that continued business is expected.

SOUTHERN DISTRICT railroad inquiry has stimulated buying in that section, and the used-tool market there is good. Railway rolling stock and locomotive orders continued strong in the New York market, with inquiries, among them a group from G.E., increasing steadily. Cincinnati business is still restricted to single items, but inquiries are picking up. Detroit reports a promising outlook for February, with automobile manufacturers re-entering the market. New England January business was decidedly improved over that of December.

CANADIAN pulp and paper manufacturers are buying machinery, in addition to the railway and electrical buyers in the market. Chicago inquiry lists from railroads are better than they have been for many months, among them a list for 40 tools from the C.M.St.P.&P. Indianapolis optimism for the future is based mainly on inquiries, but sales are increasing steadily.

THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine-tool business

THE following reports, gathered from the various machinery and machine-tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

SOUTHERN DISTRICT

Some improvement in the general machine-tool market in this district was noted the past fortnight, and the sale of used machine tools has been particularly good. Inquiry from railroads has stimulated sales somewhat, which should be reflected in deliveries for the next few months. There has been relatively little inquiry for new tools, but orders on the whole aggregated a total somewhat greater than that for the preceding two-week period. Prices generally were quoted as normal, and any variation that might be apparent in the used market would show some appreciation. Pump and electrical equipment business has increased slightly, largely attributable to orders from the milling sections and from utilities widely scattered geographically. The Standard Oil Co., of Louisiana has completed its plant at Baton Rouge, and probably will begin operations early next month.

NEW YORK

Locomotive orders headed the metal-working business during the last week, $11,400,000 in orders for 120 locomotives and 55 extra tenders being placed by Van Sweringen interests. Demand for rolling stock has been fair since the recent inquiry of the Louisville & Nashville for 1,800 freight cars. Major orders for the week were for 200 gondolas and 1,060 tank cars. Locomotive inquiry is represented by five passenger locomotives and five freight engines for the New Jersey Central. Two 70-ton, 300-hp. oil-electric switch engines have been purchased from Westinghouse, and three from the H. K. Porter Company.

The machine-tool market is showing improvement, the long-awaited inquiries from G. E. at last seeing the light of day. Inquiries are almost a glut on the market—several dealers saying that could they close on 50 per cent of inquiries outstanding, January would be a record month. The smaller dealers seem to be benefiting most in actual orders, one reporting $6,000 worth of sales to the City of New York, another for a boring machine, and so on. Miscellaneous sales of single items continue to bring in bread-and-butter money. But automobile and other sheet orders are showing steady improvement, thus making long-suffering dealers content to wait for a few more weeks. Deliveries are improving in some lines, and slowing up in others.

CINCINNATI

Improvement in general market conditions in the past week is reported by the majority of the machine-tool manufacturers of the Cincinnati district. A few reported a slight falling off of business.

National sales were well scattered and well diversified, the principal buyers being miscellaneous users whose individual requirements were small, but which formed a fair aggregate.

Orders booked and business coming in are sustaining manufacture at a good level, and some manufacturers are looking forward to a demand that will require increased production. As a rule, deliveries are being made promptly and without delay.

An encouraging feature of the week was the increased volume of inquiries which were received. These came from all sections of the country and were in regard to all types of tools. The greater portion were in regard to single tools and replacements, but here and there the requirements ere for two or three pieces of equipment. No important inquiries were reported either from railroads or the automobile field.

Selling agents report a fair demand in the week, both in the city and in adjacent territory.

DETROIT

The steady improvement that has characterized the machinery and machine-tool business here for the past three weeks is continuing, and dealers report the receipt of a number of large orders.

January was an unusually dull month, but the last two weeks were much better than the first two. February promises to be much better than January, and the orders and inquiries that are now coming in give a substantial basis for the favorable predictions that are being made. The outstanding success achieved by automobile and accessory manufacturers at the large auto shows has given them a great deal more optimism and enthusiasm. Most of the plants are going forward with fair-sized production programs and some of them are entering upon unusually extensive campaigns.

The advancement of the automotive industry has not yet been reflected in the machinery market to a large extent. A number of excellent orders have been obtained and prospective buyers are showing deeper interest in many lines of equipment than they did.

The plants are nearly all equipped for the production of the many new models on a scale commensurate with the expected demand. Should this demand be increased heavily it is likely that a large amount of machinery and equipment will have to be purchased.

NEW ENGLAND

Closing days of January registered a lower level of sales activity in New England. Business was confined to scattered orders for single units. Industrial centers continue fairly active but are occupied principally with back orders. Inquiries hold to the January rate, and deliveries quoted on these are much improved. A scattering of orders is noted from the automobile field.

Few machine-tool builders and dealers did not do as well in January as in December. Officials are not predicting when increased activity will set in. Satisfaction is expressed over the manner in which the industry has behaved during financial upheavals and has maintained a close to normal rate of new business. Builders are holding a fine total of their manpower, especially skilled workers, indicative of anticipated closings on a good volume of prospective business.

The Worcester territory is affected by the continued sharp decline in machinery buying by automobile interests. The electrical industry and the steel field are buying a good volume of grinding equipment in that section. The Johns Manville Co., Nashua, N. H., is putting $100,000 into new machinery for a new asbestos product.

CANADA

The machinery and machine-tool business in Canada has improved somewhat during the last two weeks. Orders have begun to develop from new inquiries and there is a general quickening of activity throughout the industry. Orders are fairly well scattered, but the heaviest buyers are the railroads and the manufacturers of electrical equipment. Considerable business is also being placed by the pulp and paper industry, notably in British Columbia and the Maritime provinces. During the last month, there has been an unusually heavy demand for single tools and replacements.

The automobile industry is gradually increasing its activities, and iron and steel plants are maintaining their output at a good level.

CHICAGO

Business in machine tools for the month of January, while below that of the same month of last year, reached a level which starts 1930 on a basis of renewed activity. During the last ten days of the month, inquiries have increased, a number of sales pending for several weeks have been closed, and all present indications point to a progressively better market as the year advances. Railroad inquiry predominates. The Santa Fe continues to add to its lists already in circulation. The C.M.St.P. & P. is asking prices on a list of about 40 units, among which are a number of standard railroad shop tools. Inquiries have been received from the International Harvester Co. for needed equipment, the understanding being that this is only preliminary to lists to follow. Industrialist demand, while below that of January, 1929, is increasing and is largely diversified as to the nature of equipment required. Automatic screw machines, milling machines, and lathes of various types are finding an improved market. With a few exceptions, the demand for machine tools, large and small, is reported as being better than had been expected. Used tools of standard make are selling well, dealers reporting good prices. In all but a few lines, deliveries are said to be practically normal.

INDIANAPOLIS

For the most part, January machinery and machine-tool activity was confied to inquiries. Sales were made, of course, but the volume was not large. However, the trade is very optimistic.

Just now there is considerable speculation as to what will happen in the automobile industry. Thus far the factories in Indiana, at least, have been rather indifferent buyers.

Demand for heavy tools is good, though January was not nearly so good as December. This was to be expected, according to local makers. One manufacturer stated that December was the best month his company had had. Railroads are buying their requirements and during the last week appear to be more actively in the market.

A rather steady demand is reported for general machine-shop equipment. Some demand comes from the farm implement factories for both steel and wood-working tools, as these factories prepare for the early spring trade. Both the radio and airplane industries in this state are consistent buyers and have been for some months.

Business Items

The Pacific Electric Manufacturing Corporation, San Francisco, Calif., is increasing its plant facilities to the extent of about 35,000 sq.ft. of floor area by the erection of a $100,000 two-story addition to its present building at 5815 Third St. The new structure will house the corporation's oil circuit-breaker assembly department, now occupying quarters in the general building. A feature of the new building will be the installation of a 10-ton craneway to expedite the handling of heavy parts or assembled circuit breakers.

The Roto Laundry Equipment Co., Inc., Des Moines, Iowa, is transferring its equipment and will establish its factory in the building formerly used by the Marshalltown Heater Co., Eighth and Linn Ave., Marshalltown, Iowa. Heretofore, units have been an assembled product but with the new location the company expects to manufacture all parts, except castings which will be made at the Gra-Iron Foundry Co. plant. S. P. Paulson, Des Moines, is president; W. E. Kerr, secretary-treasurer.

The Rheem Manufacturing Co., Oakland, Calif., recently purchased the Republic Steel Package Co. plant in Richmond, Calif. Rheem Manufacturing Co., Ltd., will be the name of the new corporation. The Richmond plant will continue to operate under its present schedule. The directors are D. L. Rheem, R. S. Rheem, W. K. Rheem, Frank Sutcliffe, and Herbert E. Hall.

The Moth Airplane Corporation, Lowell, Mass., plans to manufacture planes in St. Louis, Mo., and will make the change in the fall. The Lowell plant will be retained for the manufacture of accessories. The Curtiss-Wright company recently absorbed the Moth interests and will use the Robin plant in St. Louis.

At the annual meeting of the stockholders of the Eclipse Interchangeable Counterbore Co., Detroit, Judson Bradway, R. G. Mitchell, Wesson Seyburn, and M. M. Michell were re-elected as directors. The directors elected Judson Bradway president, Wesson Seyburn vice-president, and R. G. Michell secretary-treasurer and general manager. A. C. Warn continues as assistant general manager in charge of production. Mr. Seyburn was re-appointed director of sales.

The Kring-Becker Engineering Co., Mercantile Library Bldg., Cincinnati, has been appointed Cincinnati and Louisville district representative of the Pennsylvania Pump & Compressor Co., Easton, Pennsylvania.

The Wilkening Manufacturing Co., Philadelphia, is establishing a plant in Toronto to make its product for Canadian and export trade.

The Ziv Steel & Wire Co., 2945 W. Harrison St., Chicago, has announced the removal of the Detroit branch office and warehouse from 2125 Mack Ave. to 14643 Meyers Road, where a 2-story combined office and warehouse building has recently been completed.

The Kay Steel Wheel Co. and the Kay-Brunner Steel Casting Co., both of Los Angeles, heretofore operated as allied but independent corporations, announce as of Jan. 1 their consolidation in the Kay-Brunner Steel Products, Inc., with main offices at 2721 Elm St., Los Angeles.

The General Electric Co. will display working exhibits of panel and gage equipment, and similar material for airplanes at the International Aircraft Exposition in St. Louis, Mo., Feb. 15-23. C. T. McLoughlin will be in charge of the display.

The Thomas Machinery Co., 912 East 3rd St., Los Angeles, Calif., has been appointed representative of the Electric Furnace Co., Salem, Ohio, in southern California and Arizona. C. F. Henderson, Call Bldg., San Francisco, will represent the Electric Furnace Co. in northern California.

The Roberts Filter Manufacturing Co., Darby, Pa., has made application for a Dominion charter, the new company to be known as the Roberts Filter Co. of Canada, Ltd., with head offices in Toronto. The general manager will be J. P. McRae, formerly general manager of Sawyer-Massey, Ltd., Hamilton, Ontario.

The McIlroy Belting Works of Canada, Ltd., Kingsville, Ont., will be operated by the Lang Leather Belting Co., Hamilton, Ont., and the machinery and equipment is being moved to Hamilton. The McIlroy Motor Products Division of the company will be operated by the Vanguard Specialties Co., Windsor. F. B. McIlroy, president, will reside in Hammond, Indiana.

Drake, Winrod & Prichett, Oakland, Calif., have leased 1,000 sq.ft. of floor space and will engage in the manufacture of a high-pressure spring oiler and motor cleaner. The states of California, Oregon, and Washington will be served by the plant. K. I. Drake, C. A. Winrod, and Claude Pritchett are joint owners.

Voegtly & White, Oakland, Calif., have leased 30,000 sq.ft. of floor space in one of the buildings occupied by the Union Construction Co., and will engage in reconstructing and repairing a general line of machinery. The proprietors are H. A. White and William N. Voegtly.

The Apex Manufacturing Co., Inc., Syracuse, N. Y., has leased for a term of years the plant of the West Knitting Co. at Emerson St. and Harbor Ave., that city. New machinery and equipment has been installed and the production will begin Feb. 1.

The General Oil Tools Co., Los Angeles, will acquire the H. C. Smith Co., the Wyman-Kammerer & Wright Co., and the National Tool & Metal Co., of that city, according to a recent petition.

Personals

J. W. McDowell was re-elected president of the Avery Power Machinery Co., Peoria, Ill., at the annual meeting last week. George J. Jobst was re-elected vice-president, R. J. Boynton, vice-president and general manager, E. R. Bowen, vice-president and secretary, and A. G. Heundrich, treasurer. R. S. Wallace, E. C. May, T. G. Lovelace, D. H. Bethard, George W. Mitchell, and H. G. Atwood are the additional members of the board.

C. N. Brubaker has been appointed managing engineer of the transformer department of the Erie (Pa.) works of the General Electric Co., according to an announcement by H. L. R. Emmet, works manager. Mr. Brubaker is executive head of all manufacturing and engineering activities of the department.

R. F. Crudginton, works manager of the Elliott-Fisher Co., Harrisburg, Pa., has been transferred to the Bridgeport (Conn.) plant of the Underwood Typewriter Co. in a similar capacity.

George A. Yanachowski has been elected president of the Kellogg Switchboard & Supply Co., Chicago, to succeed W. L. Jacoby, who died recently.

W. C. Prendergast, export manager of the Central Alloy Steel Corporation, Massillon, Ohio, returned recently from an extended trip to European and South American export sales offices.

Jules C. Axelson is president; Delbert F. Axelson, vice-president and general manager; C. F. Axelson, executive vice-president; Clyde Ellwood,

Jules C. Axelson

vice-president and director of sales; and Everett E. Kerfoot, secretary and treasurer, of the Axelson Manufacturing Co., Ltd., Los Angeles. The company was formerly known as the Axelson Machine Co. Plans for expansion are being formulated.

Theodore Ahrens has resigned as president of the American Radiator Co., New York, but will continue as president of the American Radiator & Standard Sanitary Corporation. Rolland J. Hamilton, for many years vice-president, has been elected president of the American Radiator Company.

GEORGE M. GRAHAM, for the last two years vice-president of the Willys-Overland Co., Toledo, Ohio, has been made vice-president in charge of sales.

HARRY B. BANNISTER, manager from 1903 to 1923 of the Muncie Wheel Works, Muncie, Ind., has been appointed secretary and general manager of the Irving Auger Bit Co., Wilmington, Ohio.

Walter W. Tangeman

His advancement to vice-president of the Cincinnati Milling Machine Co. was announced last week in *American Machinist*

C. D. PROCTOR, 30 Church St., New York, N. Y., has been appointed New York district representative for John Bath & Co., Inc., 18 Grafton St., Worcester, Massachusetts.

HENRY F. BAILEY, an engineer with Lockwood Green Engineers, Inc., New York, has been appointed Cleveland office manager.

FRED T. NEBEL has been elected president and treasurer of the Rahn-Larmon Co., Cincinnati, succeeding the late Arthur J. Larmon.

A. W. LEWIS, formerly acting resident manager of the Cleveland foundry, United States Pipe & Foundry Co., Burlington, N. J., has been appointed resident manager.

T. J. SULLIVAN has been elected chairman of the board of the Great Falls Iron Works, Great Falls, Mont., reorganized recently.

C. R. PHOEBUS has sold his interest in the Warsaw Foundry Co., Warsaw, Ind., to a Marion (Ind.) company.

RICHARD L. MORRIS has been elected chairman of the board of directors of the Hoffman Machinery Co., New York, succeeding ALBERT BRUCE.

HERBERT R. MILLER, for many years identified with the Andes Stove & Range Co., Geneva, N. Y., has been elected secretary and general manager of the Co-operative Foundry Co., Rochester.

COL. W. G. BARKER has been appointed vice-president and managing director of Fairchild Aircraft, Ltd., Montreal. Colonel Barker served with great distinction throughout the War.

J. H. DOUGHERTY of the sales department, Canada Iron Foundries, Ltd., Montreal, has been appointed as general sales manager. Mr. Dougherty was formerly in charge of the Montreal office of the General Supply Co. of Canada, Limited.

Obituaries

HOWARD E. CHICKERING, a member of the sales organization of Fairbanks, Morse & Co., Chicago, for 30 years, died of heart disease at his home in Chicago on Jan. 23. He was 58 years of age, and had been manager of both the New York and Cleveland sales offices of the company prior to his retirement several years ago.

EDWIN S. GRIFFITHS, founder, president, and director of the Cleveland Machine & Manufacturing Co., Cleveland, died at Miami Beach, Fla., on Jan. 25, at the age of 59. He was also president and a director of the Buckeye Engine Co., Salem, Ohio, and a director of the Guardian Trust Co., Cleveland, Ohio.

THOMAS SHIPLEY, 69, president of the York Ice Machinery Corporation, died on Jan. 22, at York, Pa. Mr. Shipley received his education at Cooper Institute, New York. He joined the York Manufacturing Co., forerunner of the present organization, in 1897, as general manager.

G. N. CLEMSON, saw manufacturer and inventor, died in Middletown, N. Y., on Jan. 30, at the age of 74. Mr. Clemson was known as the father of the metal-sawing industry, and was the originator of the Star hacksaw.

ALBERT P. LOESCH, 41, Philadelphia district sales manager for the Wrought Iron Co. of America, died of heart failure at his home in Philadelphia recently. Mr. Loesch was one of the best known iron bolt, nut, and rivet salesmen in the East.

WALTER F. HARRIS, 87, founder and president of the Newark Rivet Works, Newark, N. J., died at his home in Madison, N. J., on Jan. 23. He founded the rivet company in 1890 and was active in its affairs until several years ago.

E. L. WHITTEMORE, chairman of the board of the National Malleable & Steel Castings Co., died on Jan. 30 at his home in Cleveland. He was 68 years of age, and had been chairman of the National company since 1913.

EDWARD J. NEUBERT, 44, purchasing agent of the Hays Manufacturing Co., Erie, Pa., and connected with the concern for 30 years, died of a sudden heart attack while at work Jan. 25.

CAPT. A. H. PAYSON, 81, for many years assistant to the president of the Atchison, Topeka & Santa Fe Railroad, died at San Mateo, Calif., on Jan. 26.

GEORGE T. HONSTAIN, chairman of the board of the Western Crucible Steel Casting Co., Minneapolis, died recently.

Forthcoming Meetings

AMERICAN SOCIETY OF STEEL TREATERS—Semi-annual meeting, Hotel Pennsylvania, New York City, Feb. 7 and 8, 1930. W. H. Eisenman, 7016 Euclid Ave., Cleveland, is secretary.

ENGINEERING INSTITUTE OF CANADA—Annual meeting Feb. 12-14. R. J. Durley, 2050 Mansfield St., Montreal, Que., is secretary.

AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS — Annual meeting, Feb. 17-20, New York City. H. Foster Bain, 29 West 39th St., N. Y., is secretary.

SOCIETY OF AUTOMOTIVE ENGINEERS—National Aeronautic Meeting, Hotel Jefferson, St. Louis, Mo., Feb. 18-20, in conjunction with the Aeronautical Chamber of Commerce, as a part of the International Aircraft Exposition. Society headquarters are at 29 West 39th St., New York.

NATIONAL MANAGEMENT CONGRESS—Stevens Hotel, Chicago, March 3 to 5. National Industrial Equipment Exposition in connection, March 3 to 7. G. E. Pfisterer, 308 W. Washington St., Chicago, is manager.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS — National Materials Handling meeting, March 5-7, Stevens Hotel, Chicago. Calvin W. Rice, 29 W. 39th St., New York City, is secretary.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Fiftieth Anniversary Celebration, Opens in New York, April 5, afternoon in Hoboken; April 6 in New York; April 7, 8, and 9 in Washington, D. C. Calvin W. Rice, 29 W. 39th St., New York, is secretary.

AMERICAN FOUNDRYMEN'S ASSOCIATION — Annual Convention, Cleveland Public Auditorium, Cleveland, Ohio, May 12-17. C. E. Hoyt, 222 W. Adams St., Chicago, is secretary-treasurer.

SOCIETY OF AUTOMOTIVE ENGINEERS—1930 Summer Meeting, French Lick Springs Hotel, French Lick Springs, Ind., May 25-29. National headquarters are at the Engineering Societies Bldg., 29 W. 39th St., New York City.

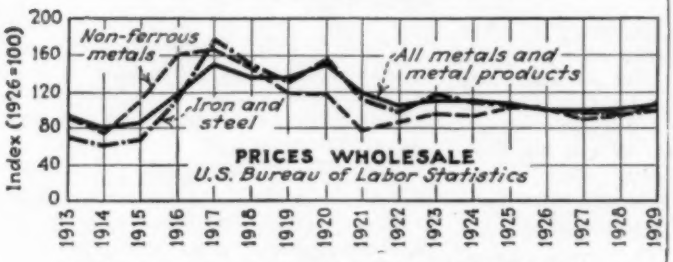
AMERICAN SOCIETY OF MECHANICAL ENGINEERS — Semi-annual meeting, Hotel Book-Cadillac, Detroit, June 2 to 12. Calvin W. Rice, 29 West 39th St., New York City, is secretary.

STEEL INDUSTRY'S EXECUTIVES—Annual Iron & Steel Exposition. Under the sponsorship of the Iron & Steel Electrical Engineers, June 16-20, Broadway Auditorium, Buffalo, N. Y. John F. Kelly, 1010 Empire Bldg., Pittsburgh, Pa., is managing director.

AMERICAN SOCIETY FOR TESTING MATERIALS—Annual meeting, Haddon Hall, Atlantic City, N. J. June 23-27. C. L. Warwick, 1315 Spruce Street, Philadelphia, is secretary-treasurer.

THE WEEKLY PRICE GUIDE . . .

Rise and Fall of the Market



Steel Prices Back To Pre-War Position With Relation To Non-Ferrous Metals

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$17.69@$18.19
Northern Basic	19.90
Southern Ohio No. 2	19.90
NEW YORK—Tidewater Delivery	
No. 2 Southern (silicon 1.75@2.25)	19.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	15.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76@22.26
Virginia No. 2	24.04
Basic	19.75@20.25
CHICAGO	
No. 2 Foundry, local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	20.01
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	20 26
Basic	20 26
Bessemer	20.76

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb:

Detroit	4.50
Cleveland	5.00
Cincinnati	4.50
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.10@2.20	3.35	3.30	3.90†
No. 12	2.15@2.25	3.45	3.35	3.95†
No. 14	2.25@2.35	3.55	3.45	4.00†
No. 16	2.35@2.45	3.65	3.55	4.10†
Black				
Nos. 18 to 20	2.45@2.55	3.85	3.55	3.70
No. 22	2.60@2.70	4.00	3.70	3.85
No. 24	2.65@2.75	4.05	3.75	3.90
No. 26	2.75@2.85	4.15	3.85	4.00
No. 28	2.90@3.00	4.75	4.00	4.15
Galvanized				
No. 10	2.60@2.70	4.20	3.80	3.80
Nos. 12 to 14	2.70@2.80	4.30	3.90	3.90
No. 16	2.80@2.90	4.40	4.00	4.00
No. 18	2.95@3.05	4.55	4.15	4.15
No. 20	3.10@3.20	4.70	4.30	4.30
No. 22	3.15@3.25	4.75	4.35	4.35
No. 24	3.30@3.40	4.90	4.50	4.50
No. 26	3.55@3.65	5.15	4.75	4.75
No. 28	3.80@3.90	5.40	5.00	5.00

* Light plates. †Up to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. butt	53.74%	41.2%	55.5%	43.5%	55.5%	42.5%
3½ to 6 in. lap	50.32%	37.78%	53.5%	40.5%	51.6%	39.0%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches External	Diameter in Inches Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28
8	2.50	8.625	8.071	.277

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb:

Thickness B.w.g. and Decimal Fractions		Outside Diameter in Inches ⅛	¼	⅜	½	1	1¼	1½
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.25†	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10†	5.30	5.00
Cold drawn, round or hexagon‡	3.50	3.65	3.60
Cold drawn, flat or square‡	4.00	4.15	4.10
Structural shapes	3.30†	3.00	3.10
Soft steel bars	3.25†	3.00	3.00
Soft steel bar shapes	3.25†	3.00	3.00
Soft steel bands	3.75†	3.65	3.65
Tank plates	3.30†	3.00	3.10
Bar iron (2.75 at mill)	3.25	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, $\frac{3}{16}$-in. thick. †Up to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse— $\frac{3}{32}$, 8.35c. per lb.; $\frac{1}{8}$, 7.85c. per lb.; $\frac{5}{32}$ to $\frac{1}{2}$, 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			19.25
Tin, Straits, pigs, New York			40.50@41.50
Lead, pigs, E. St. Louis	6.10	New York	7.00@ 7.50
Zinc, slabs, E. St. Louis	5.25@5.30	New York	6.50@ 7.50

	New York	Cleveland	Chicago
Antimony, slabs	10.50@11.00	11.50	14.50
Copper sheets, base	27.75	27.75	27.75
Copper wire, base	20 12½	20.12½	20.12½
Copper, drawn, round, base	26.25	26.25	26.25
Copper tubing, base	29.25	29.25	29.25
Brass sheets, high, base	23.25	23.25	23.25
Brass tubing, high, base	28.25	28.25	28.25
Brass rods, high, base	21.25	21.25	21.25
Brass wire, high, base	23.75	23.75	23.75

SHOP MATERIALS AND SUPPLIES

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%.....	25@26	24.30	24.30
Zinc sheets (casks).....	10.75@11.25	12.25	10.11
Solder (½ and ½).....	29.00	29.75	28@30
Babbitt metal, delivered in case lots, New York, cents per lb:			
Genuine, highest grade.....			56.00
Commercial genuine, intermediate grade.....			42.00
Anti-friction metal, general service.....			31.00
No. 4 babbitt, f.o.b.....			11.50

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va:

	Nickel	Monel Metal
Sheets, full finished.....	52.00	42.00
Sheets, cold rolled.....	60.00	50.00
Strip, cold rolled.....	55.00	45.00
Rods, hot rolled.....	45.00	35.00
Rods, cold drawn.....	53.00	40.00
Tubing	75.00*	90.00†
Angles, hot rolled.....	50.00	40.00
Plates.....	52.00	42.00

*Seamless. †Welded.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars:

	New York	Cleveland	Chicago
Crucible copper.....	14.50 @15.00	13.50	13.00 @13.50
Copper, heavy, and wire..	13.50 @14.00	13.00	12.25 @12.75
Copper, light, and bottoms	12.00 @12.25	12.00	11.25 @11.75
Heavy lead.....	4.50 @ 5.00	5.25	4.25 @ 4.75
Tea lead.....	2.87½ @ 3.12½	3.25	3.25 @ 3.75
Brass, heavy, yellow.....	7.75 @ 8.00	8.00	7.25 @ 7.75
Brass, heavy, red.....	11.25 @11.75	12.50	10.25 @10.75
Brass, light.....	6.25 @ 6.75	7.00	6.25 @ 6.75
No. 1 rod-brass turnings..	9.00 @ 9.25	8.00	7.75 @ 8.25
Zinc.....	2.50 @ 2.75	3.00	2.00 @ 2.50

TIN PLATES—Charcoal—Bright—Per box:

	New York	Cleveland	Chicago
"AAA" Grade:			
IC, 14x20.....	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20.....	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20.....	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb..	$0.13*	$0.16	$0.15
Cotton waste, colored, per lb..	.09½*	.12	.12
Wiping cloths, washed, white, per lb.....	.12½	38.00 per M	.16
Sal soda, per lb.....	.02¼	.02	02
Roll sulphur, per lb.....	.028	.03½	04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.....	.148	.164	159
Cutting oil, about 25% lard, in 5 gal. cans, per gal.....	.65	.60	.65
Machine oil, medium-bodied (55 gal. steel bbl.) per gal..	.33	.36	.24
Belting — Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin. ft., per inch of width, for single ply:			
Medium grade.....	30–10%	30–10%	35%
Med. grade, heavy wgt..	30%	30– 5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft:			
First grade.....	50%	50–10%	50%
Second grade.....	60%	60– 5%	50–10%

*Grade F.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb..	$0.0325	$0.0325	$0.0325
Cold drawn shafting...	per lb..	.035	.035	.034
Brass rods.....	per lb..	.2125	.2125	.1925
Solder (½ and ½).....	per lb..	.29	.3025	.345
Cotton waste, white...	per lb..	.13	.13	.10@.13½
Disks, aluminum oxide mineral, cloth, No. 1, 6-in. dia.....	per 100.	4.59	4.59	3.59
Lard cutting oil.....	per gal.	.65	.65	.65
Machine oil.....	per gal.	.33	.33	.30
Belting, leather, medium.....	off list..	30–10%	30–10%	30–10%
Machine bolts, up to 1x30 in., full kegs...	off list..	50-10%*	50–10%*	50%*

*List prices as of April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper*.....	$6.03	$6.03	$6.03
Emery cloth*.....	25.87	25.87	25.87
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper†.....	2.61	2.61	2.61
Cloth†.....	4.59	4.59	4.59
Fire clay, per 100 lb. bag.....	1.00	.75	.75
Coke, prompt furnace, per net ton.....	Connellsville, 2.50@2.60		
Coke, prompt foundry, per net ton.....	Connellsville, 3.50@4.85		
White lead, dry.....	100 lb. kegs ...	New York,	13.75
White lead, in oil.....	100 lb. kegs....	New York,	14.25
Red lead, dry.....	100 lb. kegs....	New York,	13.75
Red lead, in oil.....	100 lb. kegs....	New York,	15.25

*Less than 3 reams. †Less than 200.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less.....	60%
Larger, up to 1 x 30-in., full kegs, list less.....	50–10%
Less than full kegs or case lots, add to list.....	10%
Fitting-up bolts: list less.....	45%
Lag screws:	
Up to ½-in. x 6-in., list less.....	60%
Larger, list less.....	50–10%
Less than full keg or case lots, add to list.....	10%
Rivets:	
Structural, round head, full kegs, net.....	$4.50
Structural, round head, broken kegs, net.....	6.00
Tank, 7/16-in. dia. and smaller, list less.....	60%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less.....	60%
Larger, up to 3-in., list less.....	40–10%
Less than keg or case lots, add to list.....	10%
Washers:	
Wrought, full kegs, per 100 lb., list less.....	$4.00
Wrought, broken kegs, per 100 lb., list less.....	2.00
Turnbuckles:	
With stub ends, list less.....	20%
Without stub ends, list less.....	50%
Chain:	
Proof coil, base, per 100 lb., net.....	$7.10
Cast iron welding flux, per lb., net.....	.40
Brazing flux, per lb., net.....	.80

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Equipment Wanted

Conn., Berlin—Town. E. O. Shjerden, Chn.—equipment for manual training department of proposed 2 story junior high school. Estimated cost $125,000 to $150,000.

Conn., New Britain—School Dept.—appropriation for equipping foundry department for New Britain trade school, $2,200.

Mass., Boston—Mr. Dolloff, 43 India St.—No. 4 Stark bench lathe, slide rest, three speed counter.

Mich., Detroit—Michigan Tool Co., 147 Jos. Campau Ave.—machinery and equipment for the manufacture of precision tools and cutters for proposed 1 and 2 story, 100 x 260 ft. factory on Corey St. Estimated cost $300,000.

Mich., Detroit—A. Tusek, 8932 Dearborn Ave. —sheet metal working equipment including spot welder, shears, brakes and punch.

Minn., St. Paul—Dept. of Public Works, K. L. Fieseler, Purch. Agt.—will receive bids until Feb. 11 for machine tools for proposed garage.

Mo., St. Louis—Modern Coal & Material Co., Lafayette Ave.—¾ to 1 yd. bucket crawler type crane.

Ont., Fergus—Beatty Bros.—machinery and equipment for the manufacture of electric washing machines for proposed 1 story, 60 x 180 ft. addition to factory.

Ont., St. Thomas—Pere Marquette Ry. Co., Union Depot, Detroit, Mich., W. C. Atherton, Purch. Agt.—machinery and equipment for railway shops here.

Opportunities for Future Business

Ala., Birmingham—American Cast Iron Pipe Co., has work under way on the construction of a plant at Pearl and Tuscaloosa Sts. Estimated cost $15,000.

Calif., Eureka — O'Brien Bros., 315 Montgomery St., San Francisco, Archts., are receiving bids for the construction of 1 story, 110 x 140 ft. motor repair shops, etc. at 4th and A Sts. here, for Pickwick Stage System, Eureka. Estimated cost $30,000.

Calif., Fresno — New England Sheet Metal Works, 301 Broadway, awarded contract for a 1 story, 50 x 140 ft. sheet metal factory on San Benito St.

Calif., Los Angeles—Bd. of Education, plans the construction of a high school including shops, etc. at St. George St. and Griffith Park Ave. Estimated cost $400,000. G. M. Lindsey and E. P. Eiden, 609 Union Insurance Bldg., Archts.

Calif., Los Angeles — Los Angeles Box Co., 3324 South Main St., awarded contract for the construction of a 1 story, 150 x 200 ft. factory at 2615 Pitt St. Estimated cost $45,000.

Calif., Oakland — American Creamery Co., present plant for machine shop at Cypress Ave. for the construction of a 2 story creamery at 14th and Poplar Sts., also plans to remodel present plant for machine shop at Cypress Ave. and 14th St. Estimated cost $200,000. Private plans.

Calif., San Diego—Bureau of Yards & Docks, Navy Dept., Washington, D. C., will receive bids until Feb. 12, for extension to erection shop and battery and metal shop at Naval Operating Base. Noted Jan. 16.

Conn., Hartford—Auto Tire Co., 168 High St., awarded contract for a 2 story plant, including sales building, brake testing, battery charging and vulcanizing buildings, etc., on High St. Estimated cost $50,000.

Conn., New Haven—New Haven Gas Light plans prepared for additions and alterations to Co., H. L. Sterrett, 80 Crown St., is having machine, paint, service and meter repair shops, etc., on Chapel St. Estimated cost $80,000. United Engineers & Constructors Inc., 112 North Broad St., Philadelphia, Archts. and Engrs.

Md., Baltimore—St. Paul Garage Corp., c/o Wyatt & Nolting, Keyser Bldg., Archts., awarded contract for the construction of a 4 story, 190 x 194 ft. garage at St. Paul and Saratoga Sts. Estimated cost $400,000.

Mass., Foxboro—Foxboro Co., E. H. Bristol, Pres., Neponset Ave., is having plans prepared for addition and alterations to factory. Estimated cost $40,000. Private plans.

Mass., Milton (Boston P. O.)—School Dept., Town Hall, is having plans prepared for the construction of a 2 story school including manual training department, etc. on Eliot St. Shepard & Stearns, 65 Franklin St., Boston, Archts.

Mass., Salem—G. W. Pickering, 81 Washington St., awarded contract for a 1 story, 36 x 100 ft. garage and repair station at Union St. Ext.

Mass., Watertown (Boston P. O.)—Firestone Tire & Rubber Co., H. S. Firestone, Pres., 1286 Main St., Akron, O., awarded contract for the construction of a 1 story service station at 40 Arsenal St., here; also plans a 1 story garage and service station at Kansas City, Mo. Estimated cost $40,000 and $81,000 respectively.

INDUSTRIAL BUILDING CONTRACTS IN 1928 AND 1929
($40,000 or More)

	1929		1928	
	No.	Value	No.	Value
Aircraft	31	$14,818	13	$4,361
Automotive*	291	28,962	244	37,181
Chemicals, Fine	5	665	8	1,580
Chemicals, Heavy	56	7,796	43	7,477
Other Process Industries	9	2,255	20	6,661
Clay and Brick Products	25	3,620	15	2,939
Coke	3	230	4	459
Cold Storage Warehouses	19	3,327	26	10,811
Other Warehouses	85	12,184	59	13,177
Electric Power Plants	164	151,033	118	64,273
Explosives	1	40	1	300
Fertilizer	2	300	1	100
Foundries	41	4,150	35	4,752
Glass	14	10,425	9	7,506
Iron and Steel Products	107	48,920	143	19,014
Leather Goods	12	1,284	11	1,481
Lime and Cement	6	2,255	6	2,304
Lumber and Woodworking	26	4,857	21	2,652
Machine Shops	103	13,850	67	10,303
Manufactured Gas	14	2,178	12	9,765
Oils, Vegetable and Animal	1	40	1	56
Paint and Varnish	10	605	16	1,275
Paper and Pulp	26	21,136	26	8,761
Petroleum Products	46	55,346	38	6,954
Printing and Binding	55	8,639	35	6,314
Pyroxylin Products	3	2,240	3	1,120
Radio	14	3,194	4	1,200
Rayon	3	660	5	20,240
Other Textiles	101	9,705	71	9,103
Rubber Products	35	9,273	20	3,473
Soap	6	1,700	2	140
Sugar	3	280	1	40
Other Food Products	246	31,858	200	32,917
Miscellaneous Factories	644	89,488	394	56,498
total	2,207	$547,313	1,672	$355,187

*Automotive Plants and Service or Repair Garages.

N. J., Camden — S. Langston Co., 6th and Jefferson Sts., manufacturers of paper box machinery, plans the construction of a 45 x 100 ft. factory. Lockey & Herrel, 544 Federal St., Archts.

N. J., Montclair—White Motor Sales Corp., 640 Bloomfield Ave., will soon award contract for the construction of a garage at Grove St. and Glenridge Ave. Estimated cost $40,000. Lewis & Leonard, 51 East 42nd St., New York, N. Y., Archts.

N. J., North Bergen—Theurer Wagon Works, Inc., c/o G. Willaredt, 411 23rd St., West New York, Archt., is having plans prepared for a 3 story addition to factory at 3923-47 Hudson Blvd., here. Estimated cost $40,000.

N. J., North Hackensack—C. V. R. Bogert, 210 Main St., Hackensack, Archt., will receive bids about Feb. 27, for the construction of a 1 story workshop and warehouse at Hackensack Ave. and Temple St. here, for Hackensack Water Co., Main St. Estimated cost $40,000.

N. Y., Brooklyn—C. Bennett, 465 Fenimore St., will build a garage at Fenimore St. and Brooklyn Ave. Estimated cost $50,000. H. M. Sushan, 367 Fulton St., Archt. Work by day labor and separate contracts.

N. Y., Brooklyn—Connelly Construction Co., 32 Court St., plans a 1 story, 100 x 140 ft. garage at Fort Hamilton Parkway and 36th St. Estimated cost $40,000. W. F. Doyle, 12 John St., Archt.

N. Y., Brooklyn—J. S. Klas, 133 Floyd St., plans the construction of a 1 story, 100 x 120 ft. garage on East 98th St. and Winthrop St. Estimated cost $40,000. H. J. Nurick, 44 Court St., Archt.

N. Y., Brooklyn — Parkway Center Building Corp., 350 Stone St., plans the construction of a 2 story, 92 x 177 ft. garage at East New York and Schenectady Aves. Estimated cost to exceed $40,000. H. M. Sushan, 367 Fulton St., Archt.

N. Y., Long Island City — Anchor Cap & Closure Co., 22 Queens St., plans the construction of a plant. Estimated cost to exceed $500,000, also let contract for addition to present plant, $40,000.

O., Cleveland — Chain Products Co., F. G. Hodell, Pres., 3924 Cooper Ave., is having plans prepared for a 1 and 2 story, 28 x 96 ft. addition to factory. Estimated cost $40,000. Carter-Richards Co., Engineers Bldg., Archt.

O., Cleveland — Crucible Steel Castings Co., W. H. Shepard, Pres., West 84th St. and Almira Ave., had plans prepared for a 1 story addition to pattern shop and flask shop. Estimated cost $40,000. G. S. Rider Co., Century Bldg., Archt. and Engr.

O., Dayton—War Dept., Washington, D. C., awarded contract for the construction of a factory at Fairfield Air Depot here, $190,490.

O., Lorain—Thew Shovel Co., 28th and Fulton Sts., plans addition to factory. Estimated cost $40,000. Private plans.

Ore., Portland—Consolidated Truck Line, L. James, Pres., awarded contract for the construction of a 1 story, 100 x 360 and 50 x 100 ft. garage and repair shop and 21st and Quinley Sts. Estimated cost $85,000.

Pa., Pittsburgh—Bennett Bros., Water and Grant St., awarded contract for the construction of a 2 story sales and service building at 5100 Center Ave. Estimated cost $50,000.

Pa., Tarentum—Tarentum Steel Co., W. Cole, V. Pres., 1716 First National Bank Bldg., Pittsburgh, will receive bids about Mar. 1 for the construction of a steel mill to include mills, cranes, docks, railroad sidings, offices and equipment here. Estimated cost $3,000,000. L. F. Galbraith, Tarentum, Engr. Noted Jan. 2.

Tex., Port Arthur—City is having sketches made for the construction of an airport including hangars, machine shop, etc. Estimated cost $75,000. W. O. Bower, City Engr.

Wash., Seattle—Bureau of Yards & Docks, Washington, D. C., will receive bids until Feb. 26 for the construction of a 1 story shop and storehouse here.

Ont., Toronto—Aluminum Co. of Canada, 158 Sterling Rd., awarded contract for a 1 story addition to aluminum factory. Estimated cost $75,000.

Ont., Toronto — Hudson-Essex York, Ltd., 684 Yonge St., plans the construction of a 2 or 3 story garage, etc. Estimated cost $200,000. Architect not selected.

Que., Montreal—Montreal Automobiles Ltd., plans the construction of a garage on Sanquinet St. Estimated cost $200,000.

C. Z., Coco Solo—Bureau of Yards & Docks, Navy Dept., Washington, D. C., will receive bids until Mar. 5, for storehouse and engine overhaul shop at Naval Ammunition Station, here. Noted Jan. 23.